18782

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TRANSACTIONS

OF THE

AMERICAN ORTHOPEDIC ASSOCIATION.

THIRD SESSION,

HELD AT BOSTON, MASS.,

SEPTEMBER 17, 18, AND 19, 1889.

VOLUME II.

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COLLEGE OF PHYSICIANS
OF PHILADELPHIA.

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1889.

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114 W. NINTH STREET, CINCINNATI, OHIO.

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[Elected September 19, 1889.]

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18782

LIST OF PRESIDENTS.

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1887. V. P. GIBNEY, M.D.

1888. NEWTON M. SHAFFER, M.D.

1889. E. H. BRADFORD, M.D.

1890. DE FOREST WILLARD, M.D.

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MEMBERS.

1889. Bartow, Bernard, M.D. Clinical Professor of Orthopedic Surgery in the Medical Department of the University of Buffalo. 220 Franklin Street, Buffalo, N. Y.

*1887. Berg, Henry W., M.D. 241 Seventh Street, New York.

*1887. Bradford, E. H., M.D. Visiting Surgeon to the Boston City, the Children's, and the Samaritan Hospitals; Instructor in Clinical Surgery in Harvard Medical School. *President*, 1889. *Vice-President*, 1888. 149 Newbury Street, Boston.

1889. Brackett, E. G., M.D. Assistant Surgeon to Out-Patients, Children's Hospital; Physician to the Department for Nervous Diseases, Boston Dispensary; Assistant to the Department for Nervous Diseases, Boston City Hospital. 293 Marlboro Street, Boston.

*1887. Brown, Buckminster, M.D. Consulting Surgeon to the House of the Good Samaritan, Boston. 19 Marlboro Street, Boston.

*1887. Brown, Dillon, M.D. 102 E. Fifty-seventh Street, New York.

*1887. Bryant, Joseph D., M.D. Professor of Anatomy and of Clinical Surgery, and Associate Professor of Orthopedic Surgery in Bellevue Hospital Medical College; Visiting Surgeon to Bellevue and St. Vincent Hospitals; Surgeon-General National Guard. 54 W. Thirty-sixth Street, New York.

1889. Burrell, Herbert L., M.D. Surgeon to the Carney and Children's Hospitals; Surgeon to Out-Patients, Boston City Hospital; Demonstrator of Surgical Appliances, Harvard University. 22 Newbury Street, Boston.

*1887. De Garmo, W. B., M.D. Instructor in Clinical Surgery in the New York Post-Graduate School and Hospital. 56 W. Thirty-sixth Street, New York.

*†1887. Develin, Edward, M.D.

* Original Members. † Deceased.

*1887. Foster, Charles C., M.D. Orthopedic Surgeon to the Cambridge Hospital. 5 Riedesel Avenue, Cambridge, Mass.

*1887. Gibney, V. P., M.D. Professor of Orthopedic Surgery in the New York Polyclinic; Surgeon-in-Chief to the New York Hospital for Ruptured and Crippled; Orthopedic Surgeon to the Nursery and Child's Hospital at New York. *President*, 1887. *Vice-President*, 1889. Park Avenue and Thirty-fifth Street, New York.

1889. Gillette, Arthur J., M.D. Chairman Orthopedic Section of the Minnesota Medical Society. 301 Pleasant Avenue, St. Paul, Minnesota.

*1887. Goodman, H. E., M.D. Attending Surgeon to the Orthopedic Hospital. 1509 Walnut Street, Philadelphia.

*1887. Hodgen, H., M.D. 500 N. Jefferson Avenue, St. Louis.

*1887. Judson, A. B., M.D. Orthopedic Surgeon to the Out-Patient Department of the New York Hospital. *Vice-President*, 1890. 4 E. Twenty-fifth Street, New York.

*1887. Ketch, Samuel, M.D. Senior Assistant Surgeon to the New York Orthopedic Hospital; Surgeon to the Randall's Island Hospital; Clinical Lecturer on Orthopedic Surgery in the New York Woman's Medical College. *Corresponding Secretary*. 328 W. Twenty-ninth Street, New York.

*1887. Knickerbocker, George S., M.D. 352 W. One Hundred and Twenty-eighth Street, New York.

*1887. Lee, Benjamin, M.D. Secretary of the State Board of Health of Pennsylvania. *Vice-President*, 1889. 1532 Pine Street, Philadelphia.

*1887. Lovett, Robert W., M.D. Surgeon to the Samaritan Hospital; Assistant Out-Patient Surgeon to the Children's Hospital; Out-Patient Surgeon to the Carney Hospital. *Secretary*, 1889. 133 Boylston Street, Boston.

1889. McKenzie, B. E., M.D. Lecturer on Orthopedic Surgery in the Woman's Medical College; Consulting Orthopedic Surgeon to the Hospital for Sick Children, Toronto. North and Bloor Streets, West, Toronto, Canada.

*1887. Moore, J. E., M.D. Professor of Orthopedic Surgery in the University of Minnesota; Orthopedic Surgeon to St. Mary's Hospital; Consulting Surgeon to the Northwestern Hospital for Women and Children. 125 Fourth Street, South, Minneapolis, Minn.

*1887. Morton, Thomas G., M.D. Professor of Orthopedic Surgery in the Philadelphia Polyclinic and College for Graduates; Surgeon to the Pennsylvania, Orthopedic, and Jewish Hospitals;

Emeritus Surgeon to the Wills Ophthalmic Hospital; Consulting Surgeon to the Woman's Hospital and to the Pennsylvania Institution for the Instruction of the Blind, and to the Institution for the Deaf and Dumb; one of the Commissioners of Public Charities of the State of Pennsylvania. 1421 Chestnut Street, Philadelphia.

1889. MYERS, T. HALSTED, M.D. Orthopedic Surgeon to St. Luke's Hospital; Assistant Surgeon to the New York Orthopedic Dispensary; Surgeon to the Presbyterian Hospital Dispensary. 24 W Fiftieth Street, New York.

*1887. PACKARD, GEORGE B., M.D. 1405 Stout St., Denver.

*1887. PARK, ROSWELL, M.D. Professor of Surgery in the Medical Department of the University of Buffalo; Surgeon to the Buffalo General Hospital; Consulting Surgeon to the Fitch Accident Hospital and the Buffalo Eye and Ear Infirmary. 510 Delaware Avenue, Buffalo, N. Y.

*1887. RIDLON, JOHN, M.D. Assistant Surgeon at the Vanderbilt Clinic. 337 W. Fifty-seventh Street, New York.

*1887. ROBERTS, A. SYDNEY, M.D. 255 S. Sixteenth Street, Philadelphia.

*1887. RYAN, GEORGE W., M.D. Clinical Lecturer on Orthopedic Surgery in the Medical College of Ohio. *Secretary*, 1890. 114 W. Ninth Street, Cincinnati.

1889. SAYRE, LEWIS A., M.D. Professor of Orthopedic Surgery in the Bellevue Hospital Medical College; Consulting Surgeon to the Bellevue Hospital, the Charity Hospital, and the Home for Incurables. 285 Fifth Avenue, New York.

†*1887. SAYRE, LEWIS HALL, M.D.

*1887. SAYRE, REGINALD H., M.D. Assistant to the Chair of Surgery in Bellevue Hospital Medical College; Orthopedic Surgeon to the Out-door Department of Bellevue Hospital. 285 Fifth Avenue, New York.

*1887. SCHAAPS, JOHN C., M.D. Clinical Assistant to the Hospital for Ruptured and Crippled, New York; Associate Surgeon to the Department of Bones and Joints in St. Mary's Hospital, Brooklyn; Orthopedic Surgeon to the Out-door Department of St. Mary's Hospital. 486 Bedford Avenue, Brooklyn.

1889. SCUDDER, CHARLES LOCKE, A.B., Ph.B. (Yale), M.D. (Harv.). Assistant in Clinical Surgery in Harvard University. 94 Charles Street, Boston.

*1887. SHAFFER, NEWTON M., M.D. Attending Surgeon in Charge of the New York Orthopedic Hospital and Dispensary; Con-

sulting Orthopedic Surgeon to St. Luke's Hospital; Consulting Surgeon to the New York Infirmary for Women and Children. *President*, 1888. 28 E. Thirty-eighth Street, New York.

1889. Sherman, Harry M., M.D. 920 Market Street, San Francisco.

*1887. Steele, A. J., M.D Professor of Orthopedic Surgery and Diseases of the Joints in the St. Louis Post-graduate School of Medicine; Surgeon to the Augusta Children's Hospital, St. Louis. *Vice-President*, 1890. 2825 Washington Avenue, St. Louis.

*1887. Stillman, Charles F., M.D. 125 State St., Chicago.

*1887. Stimson, C. W., M.D. 68 W. Fortieth Street, New York.

*1887. Taylor, C. Fayette, M.D. 201 W. Fifty-fourth Street, New York.

*1887. Taylor, Henry Ling, M.D. 201 W. Fifty-fourth Street, New York.

1889. Townsend, W. R., M.D. Assistant Surgeon to the Hospital for Ruptured and Crippled; Instructor in Orthopedic Surgery in the New York Polyclinic. Park Avenue and Thirty-fifth Street, New York.

*1887. Vance, Ap Morgan, M.D. Surgeon to the Louisville City Hospital, to Sts. Mary and Elizabeth Hospital, and to the Masonic Widows' and Orphans' Home and Infirmary. 218 W. Chestnut Street, Louisville, Ky.

1889. Weigel, L. A., M.D. Orthopedic Surgeon to the Outpatient Department of Rochester City Hospital. 54 N. Clinton Street, Rochester, N. Y.

*1887. Whitehead, W. R., M.D. Denver, Col.

*1887. Willard, De Forest, M.D., Ph.D. Clinical Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the White Cripples' Home, the Colored Cripples' Home, and the Home for Incurables, Philadelphia; Consulting Surgeon to the New Jersey State School for Feeble-minded Children. *President*, 1890. 1818 Chestnut Street, Philadelphia.

HONORARY MEMBERS.

ELECTED.

1888. BERNARD ROTH, Esq., London.

1889. Mr. HOWARD MARSH, London.

1889. Dr. W. J. LITTLE, London.

1889. Dr. F. BEELY, Potsdamer Street 126, Berlin.

1889. Dr. LORENZ, Vienna.

1889. Dr. HENRY G. DAVIS, Everett, Mass.

†1889. Dr. DAVID PRINCE, Jacksonville, Ills.

† Deceased.

MINUTES

OF THE

THIRD ANNUAL MEETING

OF THE

AMERICAN ORTHOPEDIC ASSOCIATION.

Held at Boston, September 17, 18, and 19, 1889.

First Day—*Morning Session.*

Business Meeting.—The Association met at the Hall of the Boston Natural History Society, and was called to order by the President, Dr. Bradford, at 10 o'clock.

The Treasurer's report was read and referred to the Auditing Committee (Drs. Judson and Ryan). The Treasurer called attention to the fact that there was need of a larger annual income.

Dr. Shaffer moved that the part of By-law I., which relates to the proposal of members in the preceding annual meeting be suspended, and that the matter be left to the discretion of the Membership Committee. Carried.

Dr. Gibney proposed, and Dr. Bradford seconded, the names of Drs. W. R. Townsend, of New York, and B. E. McKenzie, of Toronto, for membership.

Dr. Bradford proposed, and many seconded, for honorary membership, the name of Dr. Henry G. Davis, of Everett, Mass.

The meeting then adjourned.

Scientific Meeting.

The meeting was called to order, and Dr. Bradford, the President, delivered an address on "American Orthopedics."

Dr. V. P. Gibney read a paper on "The Typhoid Spine."

Dr. L. A. Weigel, of Rochester, read, by invitation, a paper on "The Relation of the Thoracic and Abdominal Walls to the Spinal

Column, considered with reference to the Treatment of Antero-posterior Curvature."

Dr. Dillon Brown, of New York, read a paper on "Psoas Contraction as a Symptom."

Dr. A. B. Judson, of New York, read a paper on "The Prevention of the Short Leg in Hip Disease."

The following letter from Dr. Buckminster Brown was read:

19 Marlborough Street, Boston, Sept. 17, 1889.

Dear Dr. Bradford: Allow me to express to the "American Orthopedic Association," through you, its President, my great regret that I am unable to be present at the annual meeting in Boston.

The same cause which has prevented my attendance at the two previous meetings, the state of my health, will forbid my presence at this time. I had hoped to have had the pleasure of entertaining the members at my house, and of otherwise showing them attentions which I so earnestly desire they should receive at my hands.

From all this I am debarred, and it only remains for me to express, in the form of a letter to you, how cordially I should have tendered to the Association such hospitalities as would have shown how much I have its prosperity at heart, and the respect which I have for its individual members. From the commencement I have felt a deep interest in the welfare of the Association, and given it my earnest good wishes and God-speed, hoping and expecting that it would do a good work and take a prominent position among the medical associations of the country.

I am sure that it deserves to do so, and that the work which has been done in this line, in America, during the last fifty years, although until recently limited in extent, will, in the quality of the results, bear comparison with that of any other department of our art.

When we look back to the time when Dr. W. J. Little carried home to England, in 1837, the brilliant results on his own person, of Stromeyer's treatment of congenital talipes varus, and trace the progress of this branch of surgery, through the series of years which have intervened, its present aspect is indeed remarkable. These years have been marked, throughout, by signal advances in the treatment of large classes of cases the natural course of which leads to increasing and distressing deformity.

In other classes this period has been noted by a complete reversal of the rules for treatment, laid down by the authorities of an earlier day. These advances in treatment are often attended, in the complaints

referred to, by a success it would have been impossible to have anticipated.

It would be a pleasant task to dwell in detail upon the work of these years, and to record the vast improvements in orthopedic surgery during the last half century, previous to which, cases that are now ranked under this head were, mostly, relegated to the instrument-maker.

Beginning, for example, with the transformation of some one of the various phases of club-foot, so repulsive to look upon, and presenting, apparently, so hopeless a future, and compare it with the results of treatment during the period named.

The employment of horizontal extension or traction in spinal caries has, to a considerable extent, changed the treatment of this disease. This change has been attended by the most beneficent effects in the alleviation of suffering and in the prevention, removal, or diminution of the deformity. It was initiated in January, 1864, and I think I may venture to say that as its value becomes appreciated this course will be more and more generally adopted. For a history of its introduction I will refer to my paper on this subject, published in the *Boston Medical and Surgical Journal*, the issue of July 3, 1884.

Prolonged horizontal and oblique extension is likewise a means of treating congenital displacement of the hip, which has been attended with such a measure of success, both in this country and in England, where it has been followed by Mr. William Adams, as to encourage its adoption in future cases. This is no place to particularize further.

During the last decade the interest in orthopedic surgery has increased to an extraordinary extent, and its practice has grown to large proportions. There are many wise, skilful, and enterprising laborers in the field and the harvest has been rich and abundant.

The first volume of the published *Transactions* of the Association tells its own story, and the elder practitioners in this branch of surgery may well be proud of their successors.

Yours very truly, BUCKMINSTER BROWN.

At 12.45 P. M. the Association adjourned.

Afternoon Session.

The meeting was called to order by the President at 3 o'clock.

Dr. C. C. Foster, of Cambridge, read a paper on the "Conservative Treatment of Ankle-joint Disease, Illustrated by Two Cases."

Dr. C. L. Scudder, of Boston, read, by invitation, a paper on "A

Report of Cases of Caries of the Ankle Treated by Excision," and exhibited patients. The papers were discussed together.

Dr. John F. Ridlon, of New York, read the report of "A Case of Congenital Dislocation of the Hip."

A paper on the "Treatment of Hip Abscess," was read by Drs. R. W. Lovett and J. E. Goldthwait, of Boston.

At 6 oclock the meeting adjourned.

SECOND DAY—*Morning Session.*

The meeting was called to order by the President at 10.30.

For honorary membership the name of Dr. David Prince, of Illinois, was proposed.

For membership, Dr. Harry M. Sherman, of San Francisco, was proposed by Dr. Gibney.

Dr. Shaffer asked for the appointment of members to fill vacancies in the Membership Committee. It was moved and seconded that the members should be appointed by the chair. Carried.

Dr. Gibney moved that the annual dues be raised from five to fifteen dollars. Dr. Shaffer moved as an amendment that the motion be laid on the table. Carried.

Dr. Ryan reported for the Auditing Committee that the accounts of the Treasurer were correct, and the Committee suggested that the amount assessed as "author's corrections," be assessed hereafter against individual authors instead of the Association.

Dr. Henry G. Davis showed a traction splint.

Dr. Shaffer read a paper on "The Principles of Treatment of Hip Disease."

Dr. A. J. Steele read a paper on the "Early Local Treatment of Hip Disease."

Dr. De F. Willard read a paper on the "Operative Treatment of Hip Disease," and showed a hollow irrigation bone-scoop.

Dr. A. B. Judson read a paper on "The After-treatment of Hip Disease."

Dr. B. Bartow, of Buffalo, read, by invitation, a paper on "Treatment of Hip Disease by Fixation."

The Association adjourned at 12.45, and lunched with Dr. C. C. Foster, of Cambridge, at the Hotel Victoria.

Afternoon Session.

At 3 o'clock the Association met at the Children's Hospital. Dr. H. L. Burrell received the members and exhibited out-patients.

The following papers were read:

"An Experimental Study of Traction in Hip Disease," by Dr. E. G. Brackett, of Boston.

"An Analysis of Twenty-one Cases of Hip Disease," by Mr. J. H. Huddleston, of Boston.

Both papers were offered by invitation of the Association.

The wards of the hospital were then visited.

Evening Session.

The Association met, through the courtesy of the President, in the rooms of the Tavern Club.

Continuing the subject of hip disease, papers were read by Drs. Gibney, Ridlon, and R. H. Sayre, followed by a general discussion on the subject by members and guests.

THIRD DAY—*Morning Session.*

The meeting was called to order, in the absence of the President, by the Vice-President, Dr. Lee.

Dr. Ryan read a paper entitled "When May Treatment be Dispensed With in Spondylitis."

Dr. Steele read a paper on "A New Exercise in Lateral Curvature of the Spine."

Dr. W. R. Townsend, by invitation, read a paper on "Acute Arthritis of Infants."

The Secretary read a paper by Dr. T. H. Myers, of New York, on "Traumatism of the Hip Simulating Thyroid Dislocation."

Dr. Ryan read for Dr. V. P. Gibney, of New York, a paper on "Flat-foot."

A business meeting was called at 11.30.

It was moved and carried that By-law V. be altered to read, "The annual dues shall be fifteen dollars." Motion of Dr. V. P. Gibney.

A referred motion from last evening was reported by Dr. Lee, expressing the opinion of the Association on the treatment of hip disease, as follows:

1st. In the painful stage of hip disease complete rest to the joint is of the first importance.

2d. Early excision is to be condemned.

3d. The weight of the body should be removed from the affected limb until complete recovery has taken place.

4th. Traction is an important element of treatment.

The motion was unanimously carried.

The following were elected to active membership:

Dr. Bernard Bartow, of Buffalo; Dr. H. L. Burrell, of Boston; Dr. E. G. Brackett, of Boston; Dr. L. A. Sayre, of New York; Dr. L. A. Weigel, of Rochester; Dr. C. L. Scudder, of Boston; Dr. T. H. Myers, of New York; Dr. A. J. Gillette, of St. Paul; Dr. W. R. Townsend, of New York; Dr. H. M. Sherman, of San Francisco; Dr. B. E. McKenzie, of Toronto.

The following were elected to honorary membership:

Mr. Howard Marsh, of London; Mr. W. J. Little, of London; Dr. F. Beely, of Berlin; Dr. Lorenz, of Vienna; Dr. David Prince, of Jacksonville, Ills.; Dr. Henry G. Davis, of Everett, Mass.

The following names were proposed for membership:

Dr. O. G. Pfeffer, of Denver, Col.; Dr. D. A. K. Steele, of Chicago, Ills.; Dr. Edmund Andrews, of Chicago, Ills.; Dr. J. K. Young, of Philadelphia; Dr. A. M. Phelps, of New York.

The following were elected officers:

President.—Dr. De Forest Willard, of Philadelphia.

Vice Presidents.—Dr. A. J. Steele, of St. Louis, and Dr. A. B. Judson, of New York.

Secretary and Treasurer.—Dr. George W. Ryan, of Cincinnati.

Dr. Shaffer moved that the Publication Committee may use their discretion in accepting papers for publication in the *Transactions.* The motion was lost. As a substitute it was moved and lost that the clause "by the author in person," be stricken out from Standing Rule V. Finally, a motion by Dr. Shaffer was carried to the effect that the Publication Committee may receive for publication in the *Transactions* any paper the title of which appears upon the programme of a stated meeting.

Dr. Shaffer moved that the active membership be limited to fifty. Dr. Ryan moved that it be laid on the table. Carried.

Dr. Shaffer moved that the next meeting take place in Philadelphia on the third Tuesday in September. Carried.

It was moved that the *Transactions* should be sold to members at one dollar for the cloth edition and fifty cents for the paper; that a number be reserved for the Association, and that the sheets be left with Dr. Lovett. Carried.

Afternoon Session.

The meeting was called to order by the President at 3 o'clock.

Dr. Shaffer read a paper on "The Treatment of Ununited Fracture of the Thigh by Portative Apparatus."

Dr. R. W. Lovett showed a case of Torticollis probably due to defective eyesight, and Dr. Cheney, by invitation, made remarks on the ocular aspect of the case.

Dr. Homer Gage, of Worcester, read, by invitation, a paper on "Congenital Absence of Five Ribs with Resulting Deformities."

Dr. W. N. Bullard, of Boston, by invitation, read a paper on "Operations upon the Spine for the Relief of Pressure Paralysis, with the Report of a Case." Drs. H. L. Burrell and Morrison also made some remarks on the same subject.

Dr. A. J. Steele moved the thanks of the Association to the retiring officers for their fidelity to duty, and also to them and Dr. C. C. Foster for their kind hospitality. Carried.

Adjourned.

GEORGE W. RYAN, M.D., SECRETARY,
114 WEST NINTH STREET, CINCINNATI, OHIO.

CONSTITUTION AND BY-LAWS.

CONSTITUTION.

NAME.

I. This Society shall be called the American Orthopedic Association.

OBJECTS.

II. The purpose of this Association shall be the advancement of Orthopedic science and art.

MEMBERS.

III. The members shall be graduates in Medicine in good professional standing, who are especially interested in Orthopedic science and art.

Candidates for membership shall have been engaged in the practice of medicine for at least three years, and shall have given evidence of satisfactory scientific attainments.

FORFEITURE OF MEMBERSHIP.

IV. The Association shall have power to declare forfeiture of membership in case of any member who ceases to exhibit an active interest in the science of Orthopedic Surgery. Any active member of the Association who shall absent himself from three consecutive annual meetings shall be dropped from the roll of membership, unless he shall be able to give satisfactory reasons to the Association for his dereliction.

BY-LAWS.

ELECTION OF MEMBERS.

I. There shall be a Committee on Membership, consisting of five. All nominations shall be made in open meeting by two members of the

Association, and shall be referred to the Committee on Membership, who may report on each name as they shall think proper; such report to be made at the next annual meeting following that at which the nomination is made. But the proposers of any member may, after the report of this Committee has been received, bring such name before the Association.

The Secretary shall soon after each annual meeting send to each member of the Association a list of the names of all candidates proposed for membership, together with the names of the proposers and of the members of the Committee on Membership.

A vote of three-fourths of the members present at an annual meeting shall be requisite to an election.

The election shall be by ballot.

Every member shall sign the Constitution and By-laws.

Honorary members may be chosen by the Association in the same manner as active members. They shall enjoy all the privileges of active members, except voting and election to office and appointment on Business Committees. They shall, if practicable, sign the Constitution and By-laws.

OFFICERS.

II. The officers shall be a President, two Vice-Presidents, and a Recording Secretary, who shall also be Treasurer. Their terms of office shall be for one year. There shall be a Corresponding Secretary, whose term of office shall continue from year to year, unless limited by the Association.

The President shall conduct the meetings of the Association.

The Recording Secretary shall keep the minutes, carry out the instructions of the Association in respect to its *Transactions*, and call its meetings. He shall also take charge of moneys for the Association.

The Corresponding Secretary shall conduct all foreign correspondence.

The President and Recording Secretary shall be elected at the close of each annual meeting, to manage the affairs of the Association during the interim, and to serve at the ensuing meeting.

MEETINGS.

III. The Association shall hold its meetings annually on the third Tuesday of September, at such place as may be determined; the time and place of meeting to be advertised by the Secretary, and notice to be sent to members. Eight members shall constitute a quorum.

PROCEEDINGS.

IV. The proceedings of the Association shall be issued in pamphlet form.

There shall be a Publication Committee of two to act in connection with the Recording Secretary in publishing the *Transactions*.

FEES.

V. The initiation fee shall be ten dollars; the annual dues fifteen dollars.

EXPULSION OF MEMBERS.

VI. Any member may be expelled for cause by a three-fourths vote of those present at any annual meeting.

No action in matters of discipline shall be taken at any session of an annual meeting at which there shall be present less than three-fourths of the members registered as attending such annual meeting. A vote of three-fourths of the members thus present shall be necessary for expulsion.

ORDER OF BUSINESS.

VII. The following shall be the order of business at the annual meetings of the Association:

1. Reading records of previous meeting.
2. Appointment of Committees.
3. Report of Treasurer.
4. Report of Committees.
5. Election of new members.
6. Written communications.
7. Stated discussions.
8. Verbal communications.
9. Incidental business.

ALTERATIONS OF BY-LAWS.

VIII. A vote of three-fourths of the members present at any annual meeting shall be requisite for an alteration of the Constitution.

A vote of a majority of the members present at an annual meeting shall be requisite for an alteration of the By-laws.

Propositions to amend or alter the Constitution or By-laws must be made at one session of the annual meeting, and acted upon at a subsequent session of the same annual meeting.

STANDING RULES.

I. Whenever a candidate is proposed for membership, both the proposer and seconder shall furnish letters setting forth the claims of such candidate for membership.

II. Names of members in arrears to the Association for three years shall be stricken from the list three months after the notification of this rule has been served upon such members, except in the case of those absent from the country.

III. The Secretary shall, about April 1, send a request to each member to forward the titles of such papers, specimens, or apparatus as he desires to present at the next meeting of the Association. Such titles shall be incorporated by the Secretary in the printed call for the meeting, and these papers shall have precedence over all others.

IV. Twenty minutes shall be the maximum time allotted to the reading of any paper, unless by special vote of the Association in each case and by a two-thirds majority. Any paper requiring more than twenty minutes for its reading shall be presented in abstract under the same limitation to twenty minutes.

V. The Publication Committee may receive for publication in the *Transactions* any paper the title of which appears upon the programme of a stated meeting.

VI. All essays and contributions, the titles of which have been sent and accepted by the Association for use at its meetings shall be the property of the Association, and shall not be published or used for other purposes without the consent of the Executive Committee.

VII. All papers and other communications intended for publication shall be placed in the hands of the Secretary before November 1st; proofs of the same shall be sent to the several writers, returnable within two weeks. In case of non-compliance with this rule, any paper may be omitted from the published *Transactions* at the discretion of the Publishing Committee.

VIII. The President and Recording Secretary shall not have power to incur any debts for the Association exceeding in total the sum of one hundred dollars, unless specially authorized to do so by the recorded vote of the Association.

IX. All proceedings of the Association, not specified, shall be in accordance with the manual of the House of Representatives.

THE PRESIDENT'S ADDRESS.

By E. H. BRADFORD, M.D.,
BOSTON.

Before beginning the regular exercises of our third annual meeting, it will be well for a few moments to bring to mind the facts which have led to the organization of this Association.

Our Association is a pioneer association in the department of orthopedic surgery. This brings with it both honor and responsibility; for the department of surgery we are interested in will be promoted or injured according as our work is equal to or falls short of the opportunity, and we must clearly bear in mind that the progress of orthopedic surgery has not been that of uninterrupted advance.

The history of this branch of surgery has been often told; the first attempts in the correction of deformities are perhaps as old as surgery. The existence of this special branch may be said to date from the work of Andry, who, in the last century gave it a name; and it is due chiefly to a remarkable group of French surgeons,—Delpech, Bouvier, Bonnet, Malgaigne, Guerin, Pravaz—that the specialty may be said to owe its vitality. The German surgeons Stromeyer, Heine, Dieffenbach, Langenbeck fully equalled the French in their efforts, and too much cannot be said in praise of the work of the English surgeons. Percival Pott's name is stamped indelibly on the records of our specialty. It is to Little and his school that we Americans are more indebted than to any other foreign influence in moulding our current practice.

Even at the present time, when orthopedic surgery is so well established as is now the case in America, it is easy to note European influences—especially that of German surgery; Boeckel and Ollier, of France; Macewen, of Glasgow, and Thomas, of Liverpool.

But though great progress was made in orthopedic surgery, it is not to be overlooked that it fell from the high estate it held in general

surgical interest fifty years ago, until it became an almost despised and rejected branch. The orthopedic surgeon was regarded as a man of mere straps and buckles, or the custodian of that surgical chamber of horrors, the orthopedic institute. The reason of this decline of interest is not far to seek, if we recall the fact that fifty years ago the attention of the surgical world was turned to the remarkable feats of the great surgeons who taught us precision, skill, and boldness in the triumphs of the amphitheatre, and that the ambition of all men of energy prompted them to emulate those monarchs of the operating-table. The famous line in the Iliad,

Ἰητρος γὰρ ἀνηρ πολλῶν ἀντάξιος ἀλλῶν,

was interpreted to mean the surgeon whose feats meant so much for humanity.

Following this period came the introduction of anæsthetics, which enormously enlarged the field of possible operations; and subsequently came the introduction and perfection of the antiseptic system, which has enabled the surgeon to perform in his operations veritable marvels. It is not strange that in the active current of progress the less brilliant branch of orthopedic surgery, where successes can rarely be won in the amphitheatre, and where the element of patient, persistent work is so important, should have been for the while passed aside by the energetic and ambitious.

The history of American orthopedic surgery shows, in a degree, the same tendency in development that existed in Europe, the same interest at one period and the same decline. In the last generation, however, when American arts and sciences had begun to free themselves from the provincialism of mere imitation of European models, the natural spirit of mechanical ingenuity became manifest in this branch of surgery. This has, perhaps, in some cases, led to mechanical extravagance; but it will be universally admitted that a marked advance has been won, and that the tendency is in the right direction.

The history of orthopedic surgery in America can never be thoroughly written, as the earlier facilities for presenting cases and recording methods were necessarily imperfect in a new country. The earlier American bibliography, prior to 1860, which, through the kindness of Dr. Billings, has been copied for me from the cata-

logue of the Army Medical Library,[1] shows not only much that is of interest, but indicates by what is implied as much as by what is published, that much excellent work was done which escapes the annalist.

The first triumph in orthopedic surgery in America is the classical operation by Rhea Barton (*North American Medical and Surgical Journal*, 1827, p. 279), the founder of osteotomy for correction of deformity, as McDowell is the founder of ovariotomy.

Physick's Fixation Hip Splint, described in 1831; Chase's paper on the "Treatment of Club-foot without Tenotomy" (*American Journal of Medical Sciences*), 1841; Mütter's work on "Club-foot," in 1845,—all indicate the intelligent interest taken in the subject. Excision of the hip was first performed in this country by Dr. Wilcox, of Eastern Pennsylvania, as early as 1849.

The stimulus of Stromeyer's achievements was quickly felt in America; and tenotomies were done by Rogers (1834), Dickson (1835), and Detmold (1837). To the latter belongs the credit of the first published tenotomy, the tenotomies of the two former surgeons not having been recorded. Detmold also acted *ex cathedra*, as it were, for he was fresh from the teachings of Stromeyer. The interest taken by general surgeons of the time in orthopedic surgery is indicated by the remarks of Valentine Mott, as quoted by Mütter, of Philadelphia, and by the well-known work on *Orthopedic Surgery*, by Dr. Henry J. Bigelow, published in 1845, and which to-day is a model of excellence, and one of the best of publications to illustrate the French school of orthopedic surgery, the dominant school of the time.

An operation by Dr. Sargent, of Worcester, the section of the psoas and iliacus muscle, reported before the Worcester District Medical Society, in 1841, was a bold undertaking at that time, and should not be passed unnoticed.[2] The following account is copied from the records of the meeting of October 6, 1841:

"A boy eight or nine years of age, about three years ago was taken sick suddenly after some exercise taken in a long walk the day previous. In two or three days every limb became stiff and immovable, as though

[1] This bibliography is appended to this article.

[2] Dr. Sargent's case has never been published, and I am indebted to Dr. Gage, of Worcester, for this copy.

he were dead. In this condition he lay about three weeks. After gradually improving for some time, he was sent into the country (his father living in the city of Boston), where his health continued to improve. But there remained permanent contraction of the muscles of the whole left half of the body—with lateral curvature of the spine; contraction of muscles of lower extremities, rectus femoris and adductors of both thighs, both hamstrings, and tendo Achillis of left leg. Was six or eight months under the care of Dr. Abbe, and has been subjected to a great variety of treatment without the least benefit. Was subject to violent twitchings of the muscles of diseased parts. April 27th, divided tendo Achillis of left leg. May 3d, divided adductor longus femoris. A small artery was cut, which was followed by considerable hemorrhage, which occasioned a little abscess. Leg was let down somewhat from former position. Ten days after division of heel-cord it was perfectly united. Convulsive movements ceased in each muscle after cutting the tendons. May 19th, cut tendons of rectus femoris and sartorius; slept better the night following than he had for a long time before. This let his thigh down somewhat. After trying extension for a while, it was found, about the 2d or 3d of June, that the thigh was still held up by contraction of the psoas and iliacus internus muscles. June 17th, after consultation, proceeded to divide these muscles, which lie in immediate contact with the femoral artery, and their section also endangered the cutting of the profunda and its branches. Great hemorrhage followed the knife, but it was controlled immediately by compression. This operation let the thigh down completely, and relieved the drawing in the back, of which he complained before, whenever an attempt was made to extend the thigh. June 23d, removed all the dressings, and no bleeding; signs of large effusion; extensive lividity, etc., some vesication about parts compressed. June 26th and 27th, eschar forming below Poupart's ligament. June 30th, removed eschar and a portion of the large coagulum of blood; no hemorrhage. Removed some daily, till the whole came out, about a week after. About a week after the operation commenced extension of limb; kept the leg down and exercised it to prevent contraction. The leg, when extended, was now as long as the other. Could stand erect and walk easily in August. There still remained curvature of the spine and contraction of the abdominal muscles. But further division was out of the question. Supposing this might be acute contraction, and not permanent retraction, it was determined to try the effect of exercise of the muscles, and friction, with stimulating applications over the parts. The following pomade was used:

Ext. bellad.	ʒiij.
Tart. ant.	ʒj
Tr. opii	q. s. to form an ointment.

"This was applied perseveringly till the 24th of August, when the boy left, and went to Hadley. A fortnight ago heard from his father, that he continued to make great improvement."

Dr. Buckminster Brown has been kind enough to write for me the following outline of the history of orthopedic surgery in New England, which I quote in full:

"The history of orthopedic surgery in New England commenced in 1838, when Dr. John Ball Brown, of Boston, treated nine cases of spinal disease and curvature. Dr. Brown was for several years associate surgeon with Dr. John C. Warren, and afterward consulting surgeon at the Massachusetts General Hospital. For some years previous to the above date he had given much attention to this class of complaints. In 1839 Dr. Brown received from Paris a copy of a publication of M. Bouvier, in which he describes the operation for the section of tendons in club-foot devised by Delpech, together with the introduction by Stromeyer of subcutaneous tenotomy, his own (M. Bouvier's) modification of this method. He also received at the same time the apparatus employed in the after-treatment. Dr. Brown at once decided to perform this operation, and to pursue the method of treatment described.

"On February 21, 1839, he did the operation on a little girl four or five years of age, who had a talipes varus. The treatment was successful.[1] So far as was known to Dr. Brown, this was the first time that subcutaneous tenotomy had been done in America. He afterward learned it had been done once previously by Dr. Detmold, of New York. Dr. W. J. Little, of London, about this time published his first work on 'Club-foot and Analogous Distortions.' and this was a great assistance to the American pioneer.

"The various French treatises on this and kindred subjects by Guerin, Bouvier, Chassaignac, and others were also welcome aids during the earlier years. He imported from Europe various instruments and drawings of apparatus, invented many, and modified others.

"From the date above named, Dr. Brown had an extensive experience in this branch of surgery, and his reputation spread widely;

[1] This was the first case of club-foot treated successfully in New England. It was reported in the Boston Medical and Surgical Journal, Sept. or Oct. 1839.

patients, not only from the neighboring States, but from the South and from the West, and even from the Sandwich Islands, journeyed to Boston for the purpose of being placed under his care. In 1839 he opened, in a house hired for the purpose, a small hospital for the treatment of orthopedic cases. Dr. Brown continued in the practice of orthopedic surgery until his death, which occurred in 1862.

"Dr. Brown's treatment of talipes was essentially modelled on that of Little and Bouvier. In lateral curvature he adopted, to a certain extent, the course pursued by Jules Guerin, with modifications and improvements of his own; and in spinal caries fixation was the point aimed at.

"In 1846 Dr. Buckminster Brown returned from Europe, where he had followed the practice of Little, Stromeyer, Guerin, and others. He immediately commenced practice in his profession, at first combining the orthopedic branch with general practice, and finally confining himself to the former. From this date to the present, he has from time to time published some of the results obtained from his practice and experience.

"In 1861 Dr. Buckminster Brown took charge of a ward in the Samaritan Hospital, for the treatment of deformities."

The Children's Hospital in Boston, opened in 1866, though not an orthopedic institution, necessarily demanded treatment for cases of this sort, and has developed in this direction to such an extent that its orthopedic clinic may be said to be one of its most prominent features.

The increase of interest in this branch of surgery is marked in a practical way by the foundation of special hospitals. On May 1, 1863, the Hospital for Ruptured and Crippled, of New York, was opened by Dr. Knight, and is now one of the largest hospitals of its kind in existence, and is under the worthy direction of our former president, Dr. Gibney. In 1866, an Orthopedic Dispensary was opened in New York, by Dr. C. F. Taylor. In 1873 it was enlarged into a hospital. Dr. C. F. Taylor was appointed consulting orthopedic physician, in 1868, to St. Luke's Hospital; and in 1872, Dr. Shaffer was appointed visiting orthopedic surgeon there. The interest in the treatment of deformities by Dr. J. K. Mitchell, of Philadelphia, was active, and led to the establishment of an orthopedic hospital in that city.

The progress of American orthopedic surgery, however, gives

evidences of the same influences which delayed its progress abroad; but it is clear that the decadence of interest was less marked, and that the renaissance noticeable now in many places in Europe, came much earlier in America. For this we are specially indebted to the efforts of a few unusual men; and though others have contributed to the result, the influence of a few men is most marked on the current of orthopedic surgery.

It is not intended to consider here the different claims in small matters of priority. It is not a study of dates, but of influential factors, which the true historian is interested in. Discussion has long since ceased in our recognition of the results accomplished; and all are agreed to pay respect to Dr. Henry G. Davis for the originality and courage of conviction he displayed at a time when originality was needed. It is to his suggestion that we, as members of the Association, owe more than we realize in the treatment of hip disease, in the treatment of caries of the spine, in the elastic correction of deformities. It is hardly an exaggeration to say that, before his time, the general treatment of hip disease in common surgical practice was the actual cautery, or the seton, and we all know the results which we can gain by treatment which has grown from his suggestion. Whether we know it or not, we are all followers of the teachings of Dr. Davis.

It is difficult to do full justice to the great influence and excellence of the work of Dr. C. F. Taylor. The best tribute to him lies in his unpublished records of an unparalleled series of difficult successful cases, reaching in thoroughness of observation through many years after a time when others would have termed a cure established. Those who have witnessed his methods and results can simply add their testimony to the remarkable energy, thoroughness of method, perfect adaptation of mechanical appliances to surgical indications, and a force of character enabling him to carry, through years of discouragement, difficult cases of caries of the spine, until ultimate and permanent cures were reached. The stamp of thoroughness has marked all his work. To him we especially owe practical improvements of great importance in the traction splint; the introduction of a perfected protection splint in the convalescent treatment of hip disease; more rational methods of the mechanical treatment of club-foot; of paralytic deformities; the thorough mechanical treatment of

Pott's disease. But, more than this, we owe the fact of the introduction of a rational, thorough, practical method of treatment by mechanical means, of a class of affections needing such treatment. Without his teachings our specialty would not have attained the perfection in mechanism it has reached. He has shown clearly the need of a variation of appliances in each individual case, according to the variation of the indications, and he has shown us how to meet those indications.

It is scarcely necessary to mention the name of Dr. Sayre in connection with the subject of orthopedic surgery. His fame in this regard is world-wide. One achievement alone would be sufficient for his renown, the well-known plaster corset; but it is not for this, or for his able advocacy of excision, for which alone are due our special thanks, so much as to the one great fact of the influence he has exerted. It is to him we owe the widespread interest which brings help to us from all over the country. Orthopédic surgery is no longer—thanks to the energy of Dr. Sayre, his brilliancy as a writer and teacher—a neglected branch of surgery. The surgeon no longer looks upon the treatment of orthopedic cases as a forlorn hope of despairing surgical duty, or as a matter to be relegated to the commercial instincts of the maker of trusses. The surgeon at present no more feels that his work has been fully done, if he cuts the tendons of a club-foot and sends his patient to an instrument-maker, than would a physician, treating typhoid fever, feel justified in recognizing the affection and leaving the direction of the diet and nursing to the apothecary, with the sale of the drugs.

Dr. Sayre has not only promoted the cause of the treatment of deformities; he has broadened the field of general surgery.

One other name can be added to the list, for the painstaking, determined courage of his work, and especially for the unusual record of success won through his unparalleled persistence. The records of surgical annals can be searched in vain for a well-established cure of double congenital dislocation of the hip, until we come to the work of Dr. Buckminster Brown. Space does not permit a full mention of the names of the workers who have labored so successfully in the department of orthopedic surgery—Marsh, of Albany; Bauer, the first lecturer on the subject in America; Prince; Andrews. It is

not intended to consider here contemporaneous work, which will speak for itself.

Enough has been said to indicate that a great responsibility falls upon us in our attempt to carry on the work which we inherit, and to do full justice to the legacy which is bequeathed to us. The work in the successful treatment of the chronic cases of diseases of the hip and spine is no holiday task, is not a triumph of the amphitheatre. It demands the highest qualities of the practitioner—tact; judgment; knowledge of human nature; patience; estimate of character; the ability to gain the confidence of a fretful, suffering, petted child: the skill of a diplomat; the force to control through years of discouragement the surrounding household, ruled by a petted invalid, often despotic as a tyrant; a determined courage which can force success after years of paralysis and suppuration; the sympathy which should always be hearty, kindly, and sincere, but which should never warp our judgment. All this we know is often demanded of us. We know how rarely we can, in full measure, meet the demand; but we also know how often complete success will follow thorough work.

The successful treatment of Pott's disease, or hip disease, may not be as brilliant as excision of cancer of the pylorus; but it is more than brilliant, it is satisfactory. And though orthopedic surgery today offers many opportunities for the exercise of that surgical sense, and the art of operative interference (which we would not be worthy the name of surgeon did we not prize), yet we should remember always, as our predecessors have done, that our specialty must essentially remain conservative in the best sense of the word. It should seek to obtain results with the least sacrifice of tissue, the least impairment of function. We are bound by our calling not to maim; we must, of all surgeons, be the last to fall victims to the *délire operatoire*. But it is also incumbent on us to remember that our duty as surgeons compels us to obtain the best results in the speediest way compatible with safety to our patient, and that he certainly is unworthy—a surgical laggard—who trusts to the temporizing expectancy of a mechanical appliance, when an osteotomy, an arthrectomy, an excision is needed.

It is well for us, in endeavoring to promote the study of the proper treatment and nature of deformities and deforming joint-affections, to remember that the fact of our membership of this Association, formed

for this purpose, involves especial responsibilities from the fact that it is a pioneer organization, and that the progress of the special branch of surgery we are here interested in, will be materially advanced or delayed, according as our work is well or badly performed. Our success stimulates the endeavor of others, and our failure will check subsequent attempts.

We can trust that, as Americans, we have to some degree that spirit which we are proud to call American, which, respecting tradition, looks also for individual experience as the best of traditions, the spirit which prompts us to attempt the impossible, unmindful of the ill-success of others, trusting to ourselves. But we should also remember that individualism has also its defects, and that organizations like this of ours are often wrecked, or degenerate into assemblages of dull mediocrities or organizations of medical politics, unless the spirit of self-advancement, and the relation of mere personal triumphs, natural in all men of achievement and ambition, is subordinated to the highest scientific purpose, which alone promotes the best work.

The opportunity offered us in advancing orthopedic surgery is certainly an unusual one. The work is in many respects new. New methods are demanded in many directions. Investigation is especially needed, as well as the careful collection of recorded facts and results. Further, in no branch of surgery can greater satisfaction be gained than crowns success when success is won in the treatment of cases of our specialty.

It has been said, epigrammatically, that the practice of medicine consists of writing prescriptions while Nature effects a cure. Even in surgery, often we can claim to ourselves but little credit. "J' ai pansé: Dieu à guari," as Ambrose Paré so truly said; but sometimes we are enabled fairly to take up arms against an erring nature, by our own efforts to check the destruction of caries, correct the deformity, and cure the distortion, winning results *invito Apolline.* This is nowhere more true than in the department we devote ourselves to, and it is to the advancement of this study that we meet here, it is to be hoped, with a purpose of laboring earnestly, zealously, persistently, to promote our branch of the "noble art of surgery."

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THE TYPHOID SPINE.

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It is with some hesitation that I present this title for your consideration to-day. I regret that I am unable to assign a name to the condition of things which the following cases so well describe. I have often heard patients who had passed through typhoid fever say that they had never felt the same; that there was always a defect somewhere. Practitioners know very well that the sequelæ are legion, and my own attention has been drawn to a group of symptoms pertaining to the spinal column as sequel to this fever. On one or two occasions, when pressed for an anatomical diagnosis, I have used the term perispondylitis, meaning an acute inflammation of the periosteum and the fibrous structures which hold the spinal column together. My reason for the use of this term was the production of acute pain on the slightest movement, whether lateral or forward, and the absence of any marked febrile disturbance or neuralgia. The secretary, I discover, has put me down for "spondylitis after typhoid fever." If I could be permitted to use this term in the rheumatic sense and not in the tuberculous sense, I should not object; but whenever one uses the term spondylitis the lesion is regarded as one of osseous tuberculosis: so that I prefer, for the present at least, to speak of the affection as a typhoid spine.

The occurrence of periostitis after typhoid fever in the long bones is not at all uncommon. Dr. Keen, of Philadelphia, in one of the Toner Lectures in 1876, published in 1877, gave a full account of all the bone lesions after the continued fevers. He found sixty-nine cases following continued fevers, of which twenty-two affected the head, seven the trunk, six the upper extremities, forty-two the lower. There were forty-one cases of disease of the bone, of which number thirty-seven followed typhoid fever. In forty-seven cases traced as

to the date of occurrence, ten were within two weeks, twenty-seven from three to six weeks, and ten, months after the fever. Keen's explanation was that the earlier cases probably came from clot, and the latter from enfeebled nutrition. He found that the periostitis arose spontaneously or as a result of slight injury. In all my own cases a slight injury seemed to be the exciting cause. Sir James Paget, in *St. Bartholomew's Hospital Reports for* 1876, vol. xii. p. 2, says: "Periostitis most frequently is seen in the tibia." He has seen it near the femur, the ulna, and the parietal bone. He has found it always circumscribed, always occurring during convalescence, and never attended with delirium or fever or any severe constitutional disturbance. Aitkin says that no man can be considered fit for military service for three or four months after a severe attack of typhoid fever.

The best description I have found of periostitis after typhoid is in *Diseases of the Bones*, by Thomas Jones, F.R.C.S. Eng., etc., of Manchester, published in 1887. The explanation of periostitis is now generally considered to be a cachexia which a specific fever constitutes, and a traumatism is regarded as an exciting cause.

Case I.—In the fall of 1882 Dr. Beverley Robinson asked me to see with him the case of a lad fifteen years of age who was convalescing from typhoid fever. Toward the end of his convalescence he had begun to complain of severe pain in his back. The lumbar spine seemed to be the portion most affected, and the suffering both night and day, especially after any movement of the body, was such that narcotics were generously employed. We found no real deformity, yet there appeared to be a fulness in this region, which, upon closer examination, disappeared. There was a moderate degree of tenderness on pressure, and very great tenderness on any lateral or forward motion. There was no special pain in the distribution of the sciatic or anterior crural nerves, no infiltration in either ilio-costal space, no psoas contraction, and no rise of temperature. I had not encountered such a case before this, and was at a loss to give an explanation, or even a prognosis. I felt it my duty to protect the spinal column, and applied an apparatus as soon as possible. This seemed to afford relief, and in the course of two or three weeks he was practically well. I did not try to omit the brace, however. This he wore for about a year. I had an opportunity of observing the case from time to time, and find on my records that on June 28, 1884, I discharged him cured. The

following note was made: "There is nothing now in the way of a deformity save a little deepening of the right ilio-costal space. The spinal column seems free from any deformity, either lateral or antero-posterior; no tenderness on concussion, none on movement. At times, on making a misstep, he feels a little muscular soreness in the lumbar region." I examined him in October, 1884, October, 1885, and June, 1886, always with negative results, and found him quite able to play lawn tennis or exercise to any extent. In other words, the cure was perfect, and the diagnosis never made.

I was reminded forcibly of this case in the spring of 1888, when Dr. William M. Polk asked me to see a young lady, eighteen years of age, who was convalescing from a typho-malarial fever. The same acute pain that I found in this case reminded me forcibly of the case I have just reported. In this instance, however, it was the hip that was affected. I do not remember ever to have seen such acute suffering in an adult hip. The date of my first observation was on the 22d of April, 1888. The limb lay parallel with its fellow, and I could not execute any movement without exciting loud shrieks. She was not of an hysterical temperament—that is, had never been considered so; was rather lymphatic in temperament. The limb was not wasted, but the reflex spasm was very great. Weight and pulley and a traction hip-splint succeeded in affording relief in less than a month, and by the 7th of July she was in a fair way to recover. She sailed for Europe on this date, and in October of the same year, on her return, there was no lameness, no pain, no reflex spasm. There was some limit to the free range of motion as compared with the other limb. This case, although not a spinal one, is presented as illustrative of the supposed pathology—namely, a circumarticular lesion, confined to the periosteum and ligaments.

Case II.—On the 26th of December, 1888, I saw, in consultation with Dr. Partridge and Dr. Draper, of New York, a young man, twenty-four years of age, well developed, and always healthy and robust up to September, 1888. He had contracted typhoid fever during that month at a seaside resort, and the disease pursued a typical course. Early in November, while convalescing, he went to Boston, feeling a little uneasiness after his trip. He complained of pain in his back, which continued for eight or nine days, not severe enough to confine him to bed or to prevent him from playing tennis, which game,

in fact, gave him some relief. He then had a week's immunity from pain. An exacerbation came on after a fall while at tennis. The pain next day was very severe, and it was with much difficulty he was transferred from Boston to his home in New York. This was in the latter part of November. On his arrival in the city Dr. Draper was called, and, after one or two thorough examinations, could not discover any evidence of Pott's disease. After each examination, however, he would suffer excruciatingly, and large doses of morphine were required to give any relief. The exacerbations became more frequent, and an examination was not necessary to produce them. The recumbent posture was the only one that gave him any relief, and, on my examination, I found no fulness in either iliac fossa, nothing abnormal in the rectum, nothing in either ilio-costal space, no deformity of spine, no hard or soft tumor over the sacrum or over the ilium, no referred pain on pressure over the sciatic nerves. The hip-joint functions were perfect; no tenderness or pain at the sacro-iliac junction (the test was made by direct pressure and by crowding the alæ of the pelvis together). There was no spinal tenderness on pressure; but on deep pressure over the iliac region, especially on the left side, there was decided pain. Lateral and antero-posterior motion of the spine (passive) caused exquisite pain. He moved from the dorsal to the prone decubitus with the greatest care, fearing an exacerbation of pain. The temperature was 103° F., and had ranged from 101° to 103°; pulse 120.

The result of our consultation was that he had no Pott's disease, no sacro-iliac disease, no neuritis. The question of a deep abscess was discussed, but abscess was not diagnosed. A diagnosis of a perispondylitis, meaning either a periostitis or a subacute inflammation involving the fascia about the spinal column, was made. I believe now that he had a periostitis.

The treatment employed was with morphine to control pain, the dorsal decubitus, and the Paquelin cautery. From this time until the beginning of February he gradually improved. His exacerbations became less frequent and less severe. Toward the latter part of January he was able to sit up and even stand, but he was obliged to exercise the greatest care in moving about. I attempted early in January to fit a brace, but he was so comfortable in bed that I gave up the idea of mechanical support and decided to rely on expectant treatment purely. I made a note on March 20th that he was getting about and was nearly well. Since that a report has come to me that he has entirely recovered, has resumed business again, and does not show either deformity or awkwardness in gait.

The course pursued by this case was not at all unlike that of a periostitis, and when we consider the anatomy of the lumbar spine, the areas in this locality that are necessarily rendered sensitive by any inflammatory process, it is not at all an improbable diagnosis.

Case III.—On the 13th of April, 1889, Dr. Alfred L. Loomis asked me to see with him a gentleman from London, eighteen years of age, who had but recently came from the northern part of New York State, in a very helpless condition. The history was that in November, 1888, he came down with typhoid fever, was confined to his bed for several weeks with no complications, and on December 27th had sufficiently recovered to make a trip to New York. This was from Schenectady. He was then apparently well, remained in the city ten days, and returned in good condition. On January 10th, while skating, he fell and struck his left hip rather sharply. He did not apparently mind the blow, and a week or ten days later came to New York again, remaining here one week, during which time while in the theatre one evening, he experienced for the first time a pretty sharp pain in the region of the lumbar spine, and was quite stiff on getting up from the chair. He saw a physician the next day, who pronounced it lumbago, and a static electrical shock gave relief. He returned to Schenectady a day or two later, and was treated for lumbago with plasters, etc. The stiffness grew more pronounced, and the pains increased in severity. He found it difficult to assume an erect position without great pain. By the 10th of February he went to bed again, and there he remained until seen by a surgeon in Albany two or three weeks later. He regarded the case as one of psoas abscess. This is the report the patient brought to the city with him from his local physician. Neither Dr. Loomis nor myself could find any evidence of psoas abscess, but we found the patient difficult to examine by reason of the pain caused in moving in bed or sitting up. There was no rise of temperature; pulse about 78; respirations normal. The spinous processes in the lumbar region appeared to be a little prominent, and were tender on pressure. There was no reflex spasm at hip- or knee-joint, and the movements, if made carefully, could be executed quite easily. He had lost flesh, but his appetite now was good, and he suffered only from his disability. We decided upon a diagnosis of perispondylitis, or more properly periostitis, by exclusion.

The case was left in my hands, and I employed the Paquelin cautery for a week or ten days, three times a week. At the end of this time I applied a Knight spinal brace, and by the 9th of May he sailed for

England, having walked about and travelled on street cars for a week prior to sailing.

In talking with Dr. Loomis at the time of the consultation, he gave me the impression that he had seen very few cases like this as a sequel to typhoid fever. As pertinent to this question, I should like to present photographs of a patient, a mere lad, who came to me at the hospital about a year ago, from a town in New Jersey, with a history of these contractions following in the wake of typhoid fever. His case was briefly this:

Case IV.—A boy, aged thirteen, admitted to the hospital 25th of June, 1888, with this history: Between four and five months ago patient

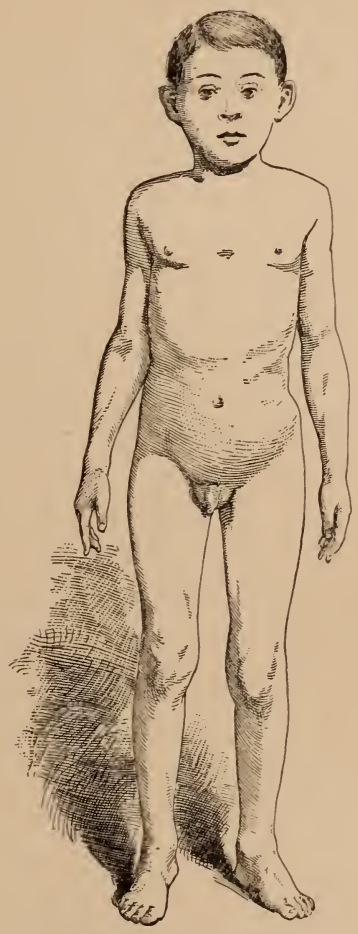
Fig. 1.

Best possible posture on admission into the hospital.

had typhoid fever. Prior to that time was perfectly healthy. While confined to his bed kept both limbs flexed on abdomen, and during convalescence was unable to straighten them. On examination, he was found to be poorly nourished, quite unable to walk, unable to sit except in the position shown in Fig. 1—that is, thighs sharply flexed on

pelvis, legs on thighs, heels touching buttocks. In dorsal decubitus any attempt at motion of the right thigh caused reflex spasm. The greatest possible extension was 70° for the right side, 135° for the left side. The greatest possible extension for the leg was, right side, 60°; left side, 100°. All motions of the right hip were limited. There were several

Fig. 2.



Best posture on date of discharge.

cicatrices of old bedsores over the sacrum and ilia. On July 10th he was etherized and both thighs and legs were forcibly extended, all resisting tissues being divided by the fascia knife. The limbs were very nearly straightened at the first sitting, and put up in plaster-of-Paris.

The subsequent treatment consisted in still further overcoming the deformity by gradual means. Finally a hip-splint was applied to the right limb, and at the date of his discharge, August 1st, the functions at the left hip were perfect; those at the right were limited about one-half. All disease seemed to be arrested, and the patient was regarded as cured. He left wearing the splint, and is to report a few months later.

Such, in brief, is an account of the cases here presented, and a pretty careful search of text-books has failed to reveal any cases of like nature. The reference in some journal articles to periostitis involving the trunk is so vague that I do not care to place them on record. Possibly many cases of obscure spinal injury after typhoid fever have been observed, yet in my own city, at least, I am sure they are uncommon. I wish it distinctly understood that I have not made a thorough search of literature, and make no claim to originality. My desire is simply to place these cases on record, and to call the attention not only of orthopedic surgeons, but of physicians in general, to a very painful affection of the spinal column following typhoid fever, and to show by my own cases that a grave prognosis need not be given.

DISCUSSION.

Dr. Newton M. Shaffer, of New York.—I have recognized this class of cases for a long time, and my experience leads me to say that the condition which Dr. Gibney so aptly describes occurs not only after typhoid fever, but I have seen it follow scarlet fever and measles. There is usually a very sensitive condition of the spine. The cases I have seen were not uniformly accompanied by high temperature. I was taught to regard them as cases of spondylitis—in short, of Pott's disease; but clinical experience has since opened my eyes. I wish to say that I had an opportunity of seeing one case which partially upholds Dr. Gibney's views as to the probable pathology of the condition. It was a case where the patient had had a severe typhoid fever, and soon after convalescence fell upon the ice. The fall was followed by acute spinal symptoms and considerable fever, which was prolonged. I saw the patient in consultation. When I examined him it was with the greatest difficulty that he could be moved in bed, but after examining him I made up my mind there was no spondylitis of

tubercular origin, and as there was a diseased brain I thought there might be an anuerism. The patient afterward passed from my observation. He went to his country home and came under the care of his family physician, and after passing through a great amount of suffering finally died. I was informed that the autopsy showed that there was a considerable periostitis of the dorsal spine, with an obscure lesion of the spinal cord. It was one of these cases, I think, described by Dr. Gibney, which went on to an unfortunate termination, following typhoid fever and traumatism. The nerve lesion may perhaps be more frequent than we suppose.

The question whether traumatism excites the condition is one that interests me very much. In some cases there is no history of traumatism except that which comes to the sensitive and vulnerable parts from the ordinary acts of locomotion. It seems to me that in the majority of cases I have seen, the condition could be traced to some form of traumatism, such as excessive exercise or a direct blow or fall after the acute fever. I think it is a condition which may follow any severe acute fever, including the exanthemata. And it might be well to say that in some cases the acute lesion of the spine terminates, as does the typhoid periostitis of other bones, in acute suppuration, with a rapid recovery in childhood.

Dr. H. G. Davis.—I will simply say that I should not consider typhoid fever as the only exciting cause of joint diseases. They may follow any disease that breaks down the system. The law appears to be that the disease to which there is a constitutional tendency will be developed whenever the general health is seriously impaired.

A case came to my knowledge recently. A gentleman had some disease of the knee-joint—was slightly lame. He went into a hospital in a distant city, where the joint was opened and, as he said, burnt. The limb was then placed in a straight splint and kept motionless for some months. When the splint was finally removed, the joint was thought to be better; but in a short time began to be painful and grew worse rapidly until it was as bad as before the operation. He was then treated by extension with a weight and improved so much that he was thought to be well, and was allowed to be up without any splint to keep up the extension. The knee became worse than ever, confining him to his bed. In about two years from the commencement of the treatment he died of Bright's disease, a constitutional tendency.

Dr. A. M. Phelps, of New York.—I would like to ask Dr. Gibney whether there was any suppuration in his cases.

Dr. Gibney.—No, sir.

Dr. George W. Ryan, of Cincinnati.—I wish to say that a short time ago I had a similar case to those reported, and I looked upon it as one of tubercular spondylitis. I changed my mind, however, four or five months afterward.

I was called to see a boy, about twelve years of age, whom the family physician had treated for typhoid fever. He complained of intense pain in the back. He got little or no rest. There was no history of trauma. He had gone to bed with a mild form of typhoid. He began to have pains in his back night and day, and would scream at the slightest jar of the bed or if some one was walking through the room. This continued for ten days; in the meantime the family physician discovered that stretching or extension gave him relief. He suspected spinal disease. I then saw the case. At the time, I said to the physician that if it was spondylitis it was one of the most acute cases I had ever seen. I never saw a child suffer so intensely as did this boy. I applied a support, and the boy four days afterward was running about freely. The paroxysms were present on the second and third days, but after the fourth day he suffered no more pain. I saw the child twice after that. I directed him to come to my office, but I was told that the child was well. Five months later he was brought to me for another trouble. When I examined his spine I could not find a trace of deformity. He was still wearing the splint. He was rapidly gaining strength and increasing in weight, and had no symptoms of spondylitis. There was no kyphosis and the rigidity had altogether disappeared. The case was an exceedingly instructive one to me, as it had in the beginning every symptom of tubercular disease—including a slight fulness in lumbar spine. I can recall in my experience but one other case, that of a little boy who had never had typhoid fever, where there seemed to be a complete cure in a few weeks of just such a condition. The view of the essayist that it is a peri-spondylitis strikes me as a very plausible one.

Dr. Charles C. Foster, of Cambridge, Mass.—I simply want to dwell upon the value of extension. I have seen it applied in a great many cases of spinal pain and inflammation, and we all know what great relief it affords. The bad temper so common in spinal caries often disappears with wonderful rapidity under extension.

Dr. John Ridlon, of New York.—I desire to express my thanks to Dr. Gibney for his very excellent paper. I have seen two cases such as he describes, and I did not know what to make of them. The point is this: there are cases that come on suddenly, and the patients suffer

considerable pain, but with rest and proper treatment they get well rapidly.

Dr. Reginald H. Sayre, of New York.—I think typhoid fever is apt to leave the bones in a condition particularly susceptible to inflammations of various kinds, such as ostitis and periostitis. I think that probably in some of the cases described by Dr. Gibney there was suppuration, as in those cases where there was a temperature of 103°, for instance. It is very likely that periostitis had been set up by some metastatic process from the ulcerated intestine, and that in spite of the broken-down condition of the patient it resolved instead of going on to the formation of an abscess or sinus opening. I think those cases which we have seen in the long bones are of fairly frequent occurrence, but whether they also have tuberculosis associated with them is a question open to doubt. Those cases which recover may be tuberculous. The fact that they have recovered in a short time without deformity would simply prove to me that the patient was of fairly good constitution, perhaps better than usual, and under appropriate treatment the tubercular mass had not pursued the usual destructive course, but that it had been arrested more promptly than is usually the case.

Of course, whether the condition is simply one of acute inflammation, or whether some tubercular process is connected with it, is a matter that cannot be decided ante-mortem in the majority of cases.

Dr. A. J. Steele, of St. Louis.—The idea which Dr. Gibney has given us is new to me. I recall to mind very distinctly a case in which following typhoid fever spinal pain and tenderness developed.

About two weeks since, a physician called me to see a patient, aged thirty-five years, who had convalesced from typhoid fever. He had pain, swelling, and tenderness over the central parts of both tibiæ. I considered it a case of periostitis and made incisions. I was disappointed in not getting pus, but gave the patient great relief. The wounds healed kindly, and the case was over.

The question arises, What caused these local inflammations after typhoid fever? I supposed they were septic in character. Just why the poison should be deposited or arrested at similar points on the two sides, I cannot say. This gentleman had received no blows or injury to his shin bones. I did not know how to account for it. If this local inflammation will occur following typhoid fever in the long bones, why may it not occur in the short bones—for example, in the vertebræ?

I thank the doctor for calling our attention to this condition.

Dr. Gibney, in closing the discussion, said: I am much pleased with the discussion on my paper. Dr. Shaffer has answered Dr.

Judson's query with regard to post-mortem examinations, so it is unnecessary for me to reply.

With regard to the remarks of Drs. Shaffer and Davis as to other fevers than typhoid producing periosteal lesions, of course, that is all well taken. I think we should remember that the kind of disease we have after the exanthemata and some of the other fevers differs from those now under consideration. We all know very well that many cases of Pott's disease, hip disease, and tubercular diseases of the knee and ankle do follow in the wake of the exanthemata. I find this true of only a small number in looking over the records of my cases following typhoid fever. There is some specific poison about typhoid fever which does not exist in the exanthemata. I am quite sure that most of us recall cases among our friends where they were a long time in getting over typhoid fever. There are some mental difficulties which cannot be fully explained. When we consider the gravity of typhoid fever, how deeply it infects the system, I think if we are going to get bone disease to follow all fevers, we ought to have more tubercular lesions following typhoid fever than we do. I have seen very few epiphysial lesions following typhoid fever. I have seen a goodly number following the exanthemata, and many are tubercular lesions.

The value of extension and rest we all appreciate and hence apply an apparatus, especially is this the case where the periosteum may be involved around certain nerves, and anything that puts those bones at rest limits the amount of excitation of the spinal nerves.

With regard to the high temperature, the gentleman with whom I saw the case explained the rise of temperature by the persistence of the typhoid state, especially in typho-malarial cases.

It is hardly necessary for me to discuss the symptoms of typhoid and typhus fevers at the present time; we have to look to the general practitioner for such discussion.

THE RELATION OF THE THORACIC AND ABDOMINAL WALLS TO THE SPINAL COLUMN, CONSIDERED WITH REFERENCE TO THE TREATMENT OF ANTERO-POSTERIOR CURVATURES.

By LOUIS A. WEIGEL, M.D.,
ROCHESTER, N. Y.

The intimate anatomical relation which exists between the different component parts of the trunk, leads to the inference that there must necessarily be a correlation of physiological action. It is self-evident, therefore, that there cannot be a change of condition in any one part, without affecting secondarily all others, to a greater or less degree.

I propose, in this paper, to review briefly the relation which the thoracic and abdominal walls bear to the spinal column, and endeavor to show that they assist materially in maintaining the upright position of the body, and must, therefore, be considered in the study of spinal curvatures.

For a long time the muscular system alone was considered the active force in the induction and maintenance of the various positions of the body. It is a recognized fact, however, that active muscular action, even when continued for a comparatively short time, induces fatigue and results in diminution of power. It is, therefore, necessary to view the function of the muscular system in an entirely different light. Active muscular contraction undoubtedly institutes changes of position and opposes a disturbance of equilibrium when the centre of gravity of the body is displaced. It is also the active force which transfers the centre of gravity to a point where an equilibrium may be established. But the ultimate effect of all muscular action is simply to decrease the work imposed upon the muscular system to the greatest possible extent, thus allowing the physical forces to do their share of work.

With reference to the spinal column, it has been clearly demonstrated by experiment, that the physical forces are sufficient to maintain the upright position, without the intervention of muscular action. This fact is also demonstrated clinically, in cases of paralysis of the sacro-spinal muscles, in which muscular action is entirely eliminated. Meyer[1] relates an interesting case of this kind. The patient was a boy of fourteen years of age. When asked to pick up an object from the floor, he dropped forward to reach it, then grasping the legs with his hands, he climbed up on them by raising alternately the sides of the trunk by contraction of the abdominal muscles, thus enabling him to grasp the leg somewhat higher up. When he reached the knees he placed both hands on them and raised himself rapidly by a simultaneous extension of the knee- and hip-joints, at the same time throwing the trunk backward, by forcibly extending the elbow-joints. He was then enabled to stand and maintain the upright posture.

In addition to this inherent tendency of the spine to remain erect, it is sustained by all the structures connected with it. In order to ascertain the exact relation the spine bore to other parts of the trunk, W. Parrow,[2] of Berlin, conducted a series of experiments on the cadaver. It was found by him that when the pelvis was fixed in such a position to allow the trunk to balance, the removal of the abdominal viscera was followed by an appreciable forward and downward movement of the seventh cervical vertebra. When the thoracic cavity was emptied the spinal column moved upward and backward to a certain extent, but did not attain its primary position. In another experiment simple incision of the abdominal walls was found to be sufficient to allow the vertebra to sink downward and forward.

In the first experiment spoken of, it will be readily seen that, by the removal of the abdominal viscera, the thoracic organs are deprived of their natural support and drag the column forward by their own weight. Thus the centre of gravity is displaced. This, however, may be restored by forcing the column back and increasing the normal posterior convexity of the dorsal segment, which will enable it to sustain the entire weight of the remaining portions of the trunk.

[1] Albert's Chirurgie, Bd. ii., 1881, S. 33.

[2] Virchow's Archiv, Bd. xxxi., 1864, S. 97.

The effect of removing the thoracic viscera after the abdominal cavity is emptied is apparent. The weight of the trunk is lessened, so that the centre of gravity is not displaced to any great extent. The spinal column, therefore, remains more nearly in its proper position.

The relation of the thorax to the spinal column is another point of interest. As stated by Parrow,[1] the first and tenth pairs of ribs, with the vertebræ and sternum, form an elastic arch which is strengthened by the interposition of other ribs. This increases its power of resistance to forces which tend to alter its shape. The anterior concavity of the dorsal curve is maintained by this costo-sternal arch, and the whole thorax forms an integral part of the spinal column. Anything which destroys or interferes with the integrity of the costo-sternal arch must necessarily change the relative conditions of the spinal column and thorax.

It has been demonstrated that when the integrity of the arch is destroyed, as, for instance, by the removal of the sternum, the normal curve of the dorsal region becomes more extended, and forms a curve of greater radius; at the same time the lumbar curve disappears entirely. This would seem to show that the superincumbent weight, or the simple force of gravity, is not sufficient to overcome the resistance to extension which the spinal column acquired by its connection with the costo-sternal arch.

The organs which this arch surrounds cannot, of course, be subjected to direct pressure, on account of the comparatively firm chest walls. As Beely[2] well says, there cannot be an increase of the intra-thoracic pressure in the sense that we speak of an increase of the intra-abdominal pressure; for with every respiratory movement and opening of the glottis an equalization of pressure would take place. The thoracic viscera, however, may be acted upon, indirectly, through the diaphragm; and in consequence of the intimate connection which exists between the ribs and vertebræ, the latter may be directly influenced by the whole thorax.

In the elaborate work of Parrow, who made a practical study of the physical conditions of the upright posture and the normal curvatures of the spinal column, upon the cadaver and the living subject,

[1] Loc. cit., p. 105.

[2] Volkmann's Sammlung klinischer Vorträge, No. 199, p. 11.

there are many other points of interest, which, however, cannot be enlarged upon at the present time.

Aside from anatomical and physiological facts, clinical evidence can be adduced to prove that the abdominal and thoracic walls assist in supporting the spinal column. Thus, it is a matter of common observation that when a patient is suffering from Pott's disease, the necessity of supporting himself on surrounding objects is not so urgent when sitting as in standing. In the sitting posture the superincumbent weight of the head and upper part of the trunk remains the same as in standing; but in the former posture the abdomen can be subjected to a certain amount of pressure against the pelvis; and thus, by forcing the viscera back and increasing the intra-abdominal pressure, act as a support to the weakened spine. Again, we often see patients suffering from Pott's disease make firm pressure over the abdomen with both hands during a paroxysm of pain, and frequently they experience the greatest amount of relief in the recumbent posture, by lying on the belly, and instinctively assume this posture.

Bampfield[1] has called attention to the fact that in antero-posterior curvature of the spine the abdominal muscles cannot act in the same manner as when they are in a normal condition; that they cannot exert the necessary pressure upon the viscera and act as effectual antagonists to the diaphragm, which causes the difficulty of respiration and disturbs the activity of the intestinal tract.

Heather Bigg[2] also says: "As a large portion of the abdominal organs are those dedicated to the function of digestion, it will easily be appreciated how curvature of the spine, by producing mechanical displacement of the organs, will give rise to a loss of alimentary tone, digestive derangements, and such constitutional disturbances as are dependent on ill or perverted nutrition; and it is not only a fact that such symptoms are accompaniments of spinal curvature, but also that they disappear under the mechanical treatment that is employed to cure the curvature itself."

A short, grunting, and suppressed respiration is one of the prominent symptoms of Pott's disease. This symptom has been ascribed to an effort on the part of the patient to prevent motion in the spinal

[1] Quoted by Beely. Op. cit.

[2] Spinal Curvature, p. 107. London, 1882.

column. The general muscular rigidity of the trunk present in these cases is undoubtedly an effort on the part of the patient to make a muscular splint, as Sayre says, but the fact that by placing the child across the lap and making gradual extension, free and easy respiration is secured, cannot be attributed entirely, in my opinion, to the possible relief of the nerves from pressure. For in some cases, in which a diminution of the curvature does not take place and is not to be expected, the respiration becomes tranquil and regular after the application of any jacket which secures a uniform support of the trunk.

In this connection the history of the first case in which Sayre applied his jacket is of interest. You will remember that the patient was a boy who was suffering from disease of the three last dorsal and first lumbar vertebræ. Sayre applied the jacket over a well-fitting shirt without resorting to the use of the so-called dinner pad. After it was applied he was fearful lest it might interfere too much with respiration, and therefore cut the jacket through from top to bottom, thus permitting a more complete expansion of the chest. The patient was at once less comfortable than before the jacket was cut. Sayre ascribes the immediate good effect of the dressing to the rest of the diseased parts secured thereby. But with a disease in the dorsal region, absolute rest certainly cannot be secured, because every respiratory effort would necessarily produce motion at the diseased part. It is more reasonable to ascribe the efficiency of the dressing to the equable support of the spine and firm pressure upon the abdomen.

The fact that a curvature sometimes increases in extent in spite of the jacket, when the disease is located in the dorsal region, is a proof that the jacket does not support the spine as a splint does a fracture. Sayre recognizes this fact by advising the use of a jury-mast in all cases where the disease is located above the mid-dorsal region. The upper portion of the dorsal region is less under the direct influence of the intra-abdominal pressure, and does not receive the direct support of the abdominal walls; hence the weight of the parts above exerts an injurious pressure upon the weakened spot and produces the marked curvature. This difficulty is obviated, to a certain extent, by the jury-mast.

A word with reference to the dinner pad. The use of a dinner pad is advised for the purpose of leaving room for meals. It is ap-

parent, however, that this is of little practical importance; for unless a very large pad is used, the intended object will not be accomplished. Leaving a large hollow space over the abdomen must necessarily interfere with the stability and efficiency of the jacket. In the history of Sayre's first case, as already stated, no mention is made of the dinner pad, and none was probably used, as it is distinctly stated that plaster-of-Paris bandages were applied around the entire trunk over a close-fitting shirt. For the past few years I have discarded entirely the use of this pad, and have seen no harm come from the omission. It has been my experience, furthermore, that patients express themselves as more comfortable when the support is applied firmly and in direct contact with the abdomen.

In the treatment of spinal affections, mechanical problems present themselves that are sometimes exceedingly difficult. The various segments of the spinal column differ not only in their relation to each other, but also in their relation to surrounding parts, which modify their function in health and demand consideration in disease. It is only by a careful study of *all* existing conditions, from an anatomical, physiological, and mechanical standpoint, that we can intelligently and successfully treat antero-posterior curvatures of the spine.

DISCUSSION.

Dr. Reginald H. Sayre, of New York.—In regard to the use of the dinner pad, it depends upon the fatness of the child whether it is to be employed or not. Those children with large pot-bellies, as we sometimes meet with them in cases of spondylitis, do not need the pad down here (illustrating) as much as they do over the chest. In a great many cases the children are emaciated, and yet have tremendous pot-bellies, and in such cases it is difficult sometimes to get the jacket tight enough as a support over the crest of the ilium, and therefore the bandages must be drawn with a reasonable degree of tightness. The jacket should be as tight as possible, and still allow proper breathing space. If the child is fairly fat I very often do not use the dinner pad. If it is thin and emaciated I usually employ it.

In regard to the catching respiration being relieved simply by the pressure of the abdominal muscles, and by the compression of the

abdominal contents up against the spine, that may partly be so. It may act as an anterior support to the spine by forcing the abdominal contents more closely against it.

I think the thoracic and abdominal contents have a great deal to do in maintaining the spine in its different positions, but I also think the removal of cyanosis and the respiration is due largely to the relief afforded by traction and immobilization as far as possible of the diseased spine, though I recognize fully the fact that it is impossible absolutely to immobilize the spine while breathing is going on. The effect of simple traction on the spine in relieving the catching respiration is seen in cases of cervical caries, where under the use of the jury-mast the breathing becomes natural, and the catch in the breath reappears as soon as the weight of the head is allowed to rest once more on the diseased spinal column. In these cases the relief afforded is in nowise due to the pressure of the thoracic and abdominal contents against the spine.

Dr. A. M. Phelps, of New York.—I think it is difficult to go into the question of discussing the arguments presented without preparing for it. I believe, however, that the spine is held in the erect position, not by the abdominal muscles, but by the physiological and anatomical construction of the bones themselves, aided by the ligaments and muscles; and that when a patient with Pott's disease is relieved by lying on his back it is not because his abdomen is tense, but because his spine is arched forward. The disease is usually located in the anterior segment of the spinal column. Arching it forward in this manner (illusting) relieves the pressure between the bodies of the vertebræ.

Dr. Weigel.—In reply to some of Dr. Phelps's remarks I simply call attention to one point in the paper, viz., that the spinal column can maintain its upright position by physical forces alone. The other forces come into play for a different purpose.

PSOAS CONTRACTION AS A SYMPTOM.

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This symptom is met so frequently in orthopedic practice, especially in connection with vertebral caries, that there is great danger of our associating it too exclusively with this disease, and, as a consequence, making grave errors in diagnosis, either by overlooking rarer conditions or by neglecting properly to exclude certain diseases which are seldom seen by the orthopedic surgeon. This is well illustrated by a case which I recently saw at the Vanderbilt Clinic. The patient was a young girl, ten years old. No clear account of the duration of her illness could be obtained, except that she had suffered from a gastro-intestinal catarrh several weeks previously, but she recovered from this in three days. She limped with her right leg, and complained of pain in the back and the abdomen. At my first examination her rectal temperature was 99° Fahrenheit. Palpation of the abdomen showed a large, hard, smooth, circumscribed tumor in the region of the cæcum. This swelling was moderately tender, but no fluctuation could be detected. Repeated explorations with the needle gave negative results. There was a marked psoas contraction on the right side, and upon stooping she protected the spine in the characteristic manner of cases of vertebral caries. When compelled to bend forward she complained of pain, although the lumbar spine seemed to have its normal curve.

However, when she bent backward the lumbar vertebræ were held rigid and straight; this was also true when the same motion was given to the spine by raising the pelvis, the patient lying flat on the abdomen. There was no kyphos. I excluded vertebral caries, from the short duration of the disease, from the flexibility of the spine upon bending forward, and from the absence of a kyphos with

such a large abscess. This was confirmed by the subsequent history of the case. The abscess opened into the intestine, and pus was passed by the rectum. Following this event the swelling slowly disappeared, and the patient made a good recovery.

The importance of making a diagnosis only after the exclusion of every disease which may present the same or similar symptoms cannot be overestimated; and this is especially true in orthopedic practice, which has a tendency to such extreme conservatism in treatment. Many joints might be saved by the early resort to active operative measures in cases of peri-articular disease were they not mistaken for joint lesions; and many lives, even, might be saved were more care taken in differentiating between acute suppurative processes and exacerbations of chronic tubercular disease. Again, it seems to me that many cases of the so-called perfect cures of hip-joint diseases and of vertebral caries, without lameness or deformity, were cases of peri-articular disease, or of some pelvic inflammation, as perinephritis, perityphlitis, etc., or even of hysteria.

After considering the anatomy and relations of the psoas and iliacus muscles, I shall briefly discuss the diagnostic value of the various phenomena which may be associated with a psoas contraction, especial attention being given to those symptoms by means of which we are aided in making a diagnosis by exclusion. The psoas magnus is placed on the side of the lumbar region of the spine and the margin of the pelvis. It arises from the bodies, from the corresponding intervertebral substances, and from the front of the bases of the transverse processes of the last dorsal and all the lumbar vertebræ. From these points the muscle passes down across the brim of the pelvis, passes behind Poupart's ligament, and with the fibres of the iliacus is inserted into the lesser trochanter of the femur. The iliacus fills up the whole of the internal iliac fossa. It arises from the iliac fossa and inner margin of the crest of the ilium; from the iliac lumbar ligament and base of the sacrum; from both of the anterior spinous processes of the ilium; from a notch between them and by a few fibres from the capsule of the hip-joint. Upon the removal of the viscera from the abdomen they are exposed, covered by the peritoneum and a thin layer of fascia. The psoas is supplied by the anterior branches of the lumbar nerves and the iliacus by the anterior crural.

These muscles, "acting from above, flex the thigh upon the pelvis, and, at the same time, rotate the femur outward from the obliquity of their insertion into the inner and back part of that bone. Acting from below, the femur being fixed, the muscles on both sides bend the lumbar portion of the spine and pelvis forward."

Besides their connection with the spine, pelvis, and femur, these muscles have relations with the kidneys; the ureters; the colon, the cæcum on the right side and the sigmoid flexure on the left; the lumbar glands; the vena cava on the right side and the aorta on the left side; the capsular ligament of the hip, from which it is separated by a synovial bursa, which sometimes communicates with the cavity of the joint; the ligamentum arcuatum internum; the renal, the spermatic, the common and external iliac, the lumbar and the femoral vessels; the genito-crural, the anterior crural, and the external cutaneous nerve; the lumbar plexus, and the sympathetic ganglia and their branches of communication with the spinal nerves; the fascia lata, and others; the peritoneum; and the quadratus lumborum, the pectineus, the rectus, and the sartorius muscle.

Psoas and iliacus contraction is manifested when the pelvis and spine are fixed, by limitation to the normal extension of the femur at the hip-joint. When the limitation is greater than 180° the thigh is flexed upon the abdomen, and rotated outward; or, if the femur is held rigid, and in a straight line, the pelvis and lumbar portion of the spine are thrown forward. With the exception of the pectineus, the five accessory flexors can act only when their action on the leg is completed or prevented; and, therefore, any limitation to extension at the hip (the knee being flexed) would indicate a contraction of the psoas and iliacus muscles.

To examine the child it should lie in the prone position, with the legs over the edge of a table. If each thigh be now separately lifted any limitation to normal extension can be easily determined.

The contraction may be due to:

1. Inflammatory changes in or around the muscles; 2. Reflex spasm, when the adjacent joints are diseased; 3. Central disease, which involves the nerves which supply the muscles; 4. Long-continued repose in the contracted position; 5. Hysteria.

Those cases which come under division 4 are easily excluded by reference to the history of the case; and those under division 3

can be excluded in the absence of other muscular contractions, and in the absence of other symptoms denoting disease of the brain or of the spinal cord. Psoas abscess due to burrowing of pus from a suppurative inflammation in distant parts, as the spleen, the liver, the pleura, etc., can be excluded by the absence of disease in these organs.

The flexion of the thigh in peritonitis, lumbo-abdominal and sciatic neuralgia, etc., is a voluntary flexion to relieve tension of the abdominal muscles or other parts.

Hysteria is apt to simulate a great variety of diseases, and often gives rise to much difficulty in diagnosis. Its manifestations are so varied that it is only after a careful study of the symptoms of actual disease that a correct opinion can be formed. Hysteria invariably overacts its part, and there is a tendency to exaggerate subjective symptoms. As a rule, there is no atrophy of the muscles as in joint disease, no febrile movement, no redness, no heat of the surface, and no swelling. It is not uncommon in males, and may occur at any period of life. The chief part of the pain and tenderness is located in the skin; it is always great, and bears no relation to the amount of changes visible or to be detected in the part. The pain rarely follows the anatomical course of any nerve, and the onset of the symptoms is generally more severe and sudden than that usually ushering in organic affections. There are usually marked hyperæsthetic spots over some parts of the spine. Such patients, as a rule, sleep well and quietly. The position during sleep may throw important light upon the case; it often happens that joints which are immovable during the day are found to be more flexed or extended during sleep, and that a patient with a supposed diseased spine will be found coiled up in a natural attitude. However, the most important aid to diagnosis is an anæsthetic. Under its influence rigid parts rapidly yield, and those parts supposed to be paralyzed often move.

In both hysteria and joint disease the muscles become relaxed under anæsthesia, but in the real disease the muscles "become alert, and restrain the movements of the joint before the patient has regained consciousness; while in the mimic disease there is no restraint until consciousness is completely regained." (Noble Smith.) In the hysterical joint the muscles retain their normal contractability,

as tested with the faradic current, while in the real joint disease contractibility of the muscles is much reduced, even in the early stage. (Shaffer.)

The reflex spasm of joint disease does not vary even during sleep, and yields to profound anæsthesia only. Reflex spasm of the muscles under consideration occurs only in diseases of the hip and of the spine. Any disease of the hip-joint which will cause a reflex spasm or a contraction of the psoas and iliac muscles, will cause an equal, and probably a greater, relative contraction of the other muscles which protect this joint; and there will be limitation to the motion of the hip in other directions than in extension, and, usually, in every direction—rotation, adduction, abduction, and flexion. The diagnosis of inflammation of the bursa, between the ilio-psoas and the capsule of the hip-joint, may present some difficulty, especially if it communicates with the joint, in which case you will get joint symptoms. There is an inguinal tumor which increases under exercise, and decreases under rest. The tumor is cystic, and there is a marked tendency to recurrence. The joint movements are free, except in extreme flexion. There is no glandular enlargement, no atrophy, and no shortening of the leg or thigh, and usually but trifling inflammation in the surrounding tissues. Pressure on the obturator nerve may cause pain in the hip and knee. The diagnosis between the different diseases which may be present in the hip-joint will not be considered in this connection.

Acute epiphysitis and phlegmons of the peri-articular tissues are very liable to be mistaken for an exacerbation of a very slow, obscure chronic ostitis of the joint, or for a residual abscess from vertebral caries. The deformity and the location of the abscess are of no diagnostic importance. There may be atrophy and shortening, but there is no genuine reflex spasm. The invasion is nearly always acute, beginning with pain, febrile movement, and induration; while in tubercular joint disease the pain and lameness always precede, by some time, the infiltration of the soft parts.

There remain now for consideration vertebral disease and the iliac phlegmons, which include pelvic cellulitis, perinephritic and perityphlitic abscess, disease of the ileum and of the sacro-iliac joint, and primary inflammation in the ileo-psoas muscle. Cancer of the kidney may rarely affect the psoas, in which case it might be

confused with a perinephritic abscess, and this is especially true of the most common form of primary cancer found in this region, the soft or medullary. Not infrequently cavities form containing degenerated cancerous material, which give a fluctuating feeling. The diagnosis hinges upon the discovery of a renal tumor, which is felt between the ribs and pelvis latero-anteriorly; but a positive diagnosis can be made only when hæmaturia is also present.

In sacro-iliac disease the psoas is never affected until after suppuration has taken place, and in those cases only in which the pus has discharged itself within the pelvis. The pelvic surface of this articulation can be very accurately explored by rectal examination, and, therefore, it is a very simple matter to determine by the rectal touch the presence of disease at such an advanced stage.

When any acute angular curve of the spine exists with marked rigidity in the same location, there can be no difficulty in recognizing the nature of the disease. An aneurism of the aorta may cause absorption of the bodies of the vertebræ by pressure, and, as a result, cause a projection of the spine and pain, which is unilateral. However, there should not be much difficulty in excluding this origin of the kyphos. The difficulty of diagnosis lies in the early stage of vertebral caries before any deformity has appeared. Local and persistent pain, with rigidity of the spine on motion in every direction, and reflex spasm of the muscles which protect the vertebræ, are the early signs of the disease. Even before this period the patient has been languid, listless, and unwilling to move much for some time; he complains of being constantly tired. The pain is usually symmetrical, and is relieved by extension. It is most frequently experienced at the periphery of the spinal nerves, and may be referred (in dorsal and lumbar disease) to the epigastrium or umbilical region, to the skin over the ilium, to the groin, hip, knee, ankle, front of thigh, inner side of leg or foot, or to the ball of the great toe. The chief point of difference between the pain of the vertebral caries and that of the abdominal viscera is that recumbency generally relieves the former more quickly than the latter.

If the suspected portion of the spine is flexible in any direction vertebral caries can be excluded. Very often in phlegmons involving the psoas the spine is rigid when bent in that direction, which puts this muscle on the stretch, although there may be the normal amount

of flexibility in other directions. Also, in this condition the characteristic stoop of vertebral disease, in which the spine is protected and held rigid, may be closely simulated.

Nearly all the pelvic phlegmons may involve the psoas and iliacus muscles, this direction offering the least resistance to the extension of pus. König's experiments on the cadaver, as quoted by Thomas, showed the most probable route which these accumulations would take: 1. Injecting air or water beneath the peritoneum, near the ovary or tubes, the injection ran along the psoas and the iliacus muscles into the pelvis. 2. Beneath the lateral ligament, near the cervix, it filled the same side of the pelvis, ran along the round ligament toward Poupart's ligament, and to the iliac fossa. 3. Beneath the broad ligament behind the cervix, it filled the posterior and lateral part of the pelvis, and passed along the psoas and iliacus muscles into the pelvis. The pelvic abscesses may be divided into two classes: (*a*) the subperitoneal, which is situated between the peritoneum above and the iliac fascia below; this includes the perityphlitic abscesses and those resulting from suppuration in the tissues around the uterus, tubes, broad ligaments, and ovaries; (*b*) the sub-aponeurotic, which is situated within the sheath of the psoas and iliacus muscles. However, it must be remembered that pus does not always respect aponeurotic barriers, and will often follow erratic paths. This is so often true that the point which pus selects to escape is of very little diagnostic value.

It is in the subperitoneal tissue that the external iliac vessels and their branches, with a chain of lymphatic glands, as well as the ureter, are situated. This is of diagnostic importance, as pressure upon these vessels will cause œdema of the lower extremity, and pressure upon the ureter will be followed by all its bad consequences. Inflammation of the areolar tissue in the pelvis is usually an acute disease, which rapidly goes on to suppuration. During the formation of pus there will be violent chills, followed by fever, sweating, and prostration. There is a throbbing pain in the pelvis, which may extend down the thigh. Abdominal palpation, combined with rectal touch, will show a fluctuating tumor.

A positive diagnosis of necrosis of the ilium cannot be made until the abscess has been opened and the dead bone detected. The muscular fibres of the psoas are very fine and delicate, and are, on this

account, particularly liable to rupture and prone to inflammation. When psoitis does occur the inflammatory process runs quickly to suppuration, and it is seldom that we get an ilio-psoitis which does not show the presence of a tumor upon deep abdominal palpation.

In both perityphlitic and perinephritic abscess there is evidence of an acute disease, as shown by fever and rapid prostration; and pain, increased by motion, is a prominent symptom. In both the patient is confined to the bed, and lies with the thigh flexed.

Perinephritic abscess is not a frequent disease, and the pus does not usually make its way along the psoas muscle. The tumor is felt in or a little below the lumbar region, over the kidney, and the pain, which is referred to this location, shoots downward to the lower extremity and the testicle. There is more or less subcutaneous œdema over the tumor and tenderness on deep pressure. The urine is unaffected unless the kidney is involved. Rectal examination is negative.

Perityphlitic abscess is usually the result of a subacute typhlitis. It is always on the right side, and an important aid to diagnosis is the usual history of one or more previous attacks of sudden pain in the right side of the abdomen, accompanied by vomiting and constipation. It is always accompanied by peritonitis, which is usually circumscribed. Treves has demonstrated that the cæcum is *completely* enveloped by the peritoneum.

The tumor is located on the right side over the cæcum, which lies on a horizontal line which connects the two anterior superior spinous processes of the ilium, at a point where this line intersects the outer margin of the right rectus muscle. The tumor may be as large as a man's fist, and is felt on deep palpation through the abdominal walls, as well as by the rectal touch. There is marked tenderness on pressure over the tumor. The peritoneal inflammation produces a paralysis of the muscular tunic of the cæcum, so that it becomes distended by gas. This may be so great that a circumscribed prominence, corresponding to the area occupied by this portion of the large intestine, is manifest to the eye and felt through the abdominal walls. Tympanitic resonance on percussion and crepitation from the presence of intestinal gas are diagnostic points when it is the result of a typhlitis. If the disease is primary without opening into the intestines there is flatness on percussion. It is well to remember

that a psoas contraction with a characteristic attitude and limp may remain for months after all evidences of acute disease have disappeared.

The character of the pus may throw some light upon the origin of the disease. It may contain gas and fecal matter, or pieces of bone. The presence of the *bacillus tuberculosis* may be demonstrated, and this is of the greatest value in distinguishing between syphilitic and tubercular disease.

Besides the localization of the lesions, it is of the greatest importance, from a therapeutical point of view, to recognize the type of the inflammation. This may be simple tubercular, syphilitic, pyæmic, rheumatic, etc.; and it requires no argument to show the necessity of a differential diagnosis as far as possible. This is especially true of the syphilitic and the tubercular disease, which are often confused, as they resemble each other so closely that it is very difficult to distinguish them. To discuss this branch of the subject would unduly prolong this paper.

DISCUSSION.

Dr. V. P. Gibney, of New York.—We ought to thank Dr. Brown for bringing this matter before the Association. I would like to ask Dr. Shaffer whether he has met with cases of idiopathic psoitis. Several years ago I looked up the subject and was unable to find any reports of cases. I have also looked for cases in practice. I find that psoas contraction is due to some other condition of things and not to a primary inflammation of the psoas muscle, and if this is generally true, it will rule out one of the elements of diagnosis.

Another point I am not sure about is this: whether anæsthesia will at all times enable us to rule out the hysterical element. My impression has been that it would, but two or three years ago a friend asked me that question after a meeting in New York, and he referred me to some German authority who claimed it would not do so. I cannot, however, speak definitely on this subject. I would like to hear that point discussed.

Dr. Newton M. Shaffer, of New York.—It has been my custom for many years to examine the condition of the psoas muscle in all the lesions occurring at the hip or spine, or at any point below the dia-

phragm. I am very glad the matter has been brought up and so ably presented. We do not pay enough attention to examination of the ilio-psoas magnus muscle in patients, which, I think, more than any other one muscle concerns the orthopedic surgeon.

With regard to hysterical contractures, I recall one or two cases which I have seen with Weir Mitchell. It had formerly been my experience that "contracture" was due to some lesion of the spinal centre and was not "hysterical." In following these cases up, it was demonstrated (as others also have demonstrated) that contracture of a permanent kind might be present in true hysteria and that these contractures would not yield to anæsthesia. I have also noted the absence in one case of hysterical contracture of any other hysterical manifestation. I have seen two or three cases, one especially of the knee (which I also saw with Weir Mitchell), where the temperature of the affected knee rose every afternoon four degrees higher than the temperature of the other knee-joint. The patient went to Europe for further advice and after her return the joint was opened with a view to removing the tubercular disease by a prominent surgeon in New York. It was found to be apparently in a perfectly healthy condition. The difficulties of differential diagnosis are not lessened by the fact that heat, swelling, redness, permanent contracture, etc., may be present in the so-called hysterical cases.

Dr. Charles C. Foster, of Cambridge, Mass.—There is one cause of psoas contraction that Dr. Brown did not mention, and that is, rectal fistulæ high up.

Dr. Homer Gage, of Worcester, Mass.—I have seen one case where psoas contraction appeared suddenly two or three days after a slight injury. During the interval there had been no symptoms—the child attending school as usual. I saw him three weeks later. He was unable to stand or even sit up in bed, was much emaciated, and had a temperature ranging from 100° to 103°, with evidence of deep inflammation and suppuration in the right iliac fossa, and general septic infection. Besides the induration the most marked symptom was the psoas contraction. In spite of his desperate condition it was decided to open the abscess, discover its source, and if possible remove it. I did this under strict antiseptic precautions, but was unable to find any cause, and the patient died three days later. At the autopsy the pus was followed down into the sheath of the psoas muscle to a point about two inches from its origin, and into the muscle itself, where the destructive character of the inflammation was most marked. The cæcum and appendix were not involved. Although it is of course possible that

this may have been a phlegmon beneath the deep pelvic fascia, which had burrowed into the psoas muscle, I have always felt that the extent of the destructive process within the muscle and the appearance of the track by means of which it communicated with the more superficial abscess, pointed to an intra-muscular origin, and made the case more probably one of idiopathic ilio-psoitis.

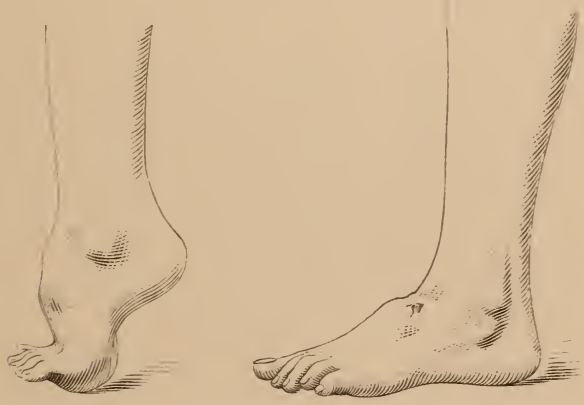
Dr. Gibney.—I would like to ask the doctor whether there was any disease of the spinal column.

Dr. Gage.—No, sir

A CASE OF CARIES OF THE ANKLE, TREATED CONSERVATIVELY.

By CHARLES C. FOSTER, M.D.,
CAMBRIDGE, MASS.

So much has been said and written of late concerning the operative treatment of caries of joints, that I fear the value of conservative treatment in such cases is not fully appreciated; therefore I wish to present the following case as an example. It was treated at the Cambridge Hospital over a year ago.



At the time of beginning treatment the patient, Mary D., was twelve years old. For seven or eight years she had had caries of the tarsus. Of late the disease varied in activity from time to time. A sinus would open, discharge for some months, then close. The whole tarsus was completely riddled. I counted seven distinct scars, and was told that many of them had discharged more than once.

If I had attempted anything like a thorough removal of diseased bone by resection, which thoroughness seems to be now considered necessary to success, I think little or nothing would have been left between the os calcis and the phalanges. The best result then to be hoped for would have been a flail-joint; which I do not consider good, though some others appear to.

When the disease was quiescent she could use the foot a little, but was often laid up by a fresh attack.

It seemed to me that the disease had about run its course, and was ready to stop if given a fair chance; but that walking upon the foot in its present position, equinus, so ground the affected bones together as to keep up sufficient irritation to prevent this.

Waiting for a period of quiescence, when all sinuses had been closed for ten days, I operated.

The condition at the time was as follows: The disease had lasted seven or eight years, and was still active. The tarsus seemed completely riddled, and showed scars of seven old sinuses, one of which had been discharging up to ten days before. The tibia was about one and a quarter inches shorter than its mate. The general health was fairly good.

I divided the plantar fascia thoroughly; also the abductor pollicis and tendo Achillis. I found the skin under the instep glued tightly to the bones by old adhesions, which I dissected up with the tenotome, subcutaneously.

I made no attempt to force the foot into position, or to break down adhesions. I did not use plaster-of-Paris, but applied a steel shoe with simple up-and-down motion, exerting at first only very gentle pressure. From day to day the pressure was carefully increased; the foot steadily yielding, and approaching a normal position. No pain worth mentioning was caused at any time. Later passive motion was carefully used to improve the flexibility of the joint.

Now the question came up: "How near normal position shall I bring that foot, to insure the greatest usefulness?"

The tibia on that side being one and a quarter inches short, I left the tendo Achillis about one-half an inch shorter than normal, trusting to the tilting of the pelvis to compensate for the remainder of the shortening.

The heel of the shoe for the affected foot was built up one-half an inch. This was not a case in which I could expect a perfect result, but must make the most of what material I had; which is the sum and substance of conservative surgery.

When the patient had regained some power in the foot, and some control over it, I let her begin to use it; at first simply standing upon both feet at once, then taking a step or two leaning on somebody's arm, and so on; still wearing the steel shoe.

Later I put her into a properly made pair of leather lace-boots; the one for the affected foot having a raised heel, a steel shank, and some

building up under the instep to support it. She has worn such ever since.

All this time she was being taught to walk; that is, if she used her foot clumsily, or walked with a "dot-and-go-one" gait, she was cautioned and made to do better. This training is very important in all foot cases; it is a good deal of trouble for the surgeon and for the parents, but if thoroughly carried out it pays well in the end.

At first the leather shoes were worn only a short time daily; this time was gradually increased, the steel shoe being for some time longer worn at night as a precaution. When at last this was given up all treatment was finished.

From the day of operation until now there has not been a single check or an unfavorable symptom.

The foot is now surprisingly well shaped; its motion is excellent, and it is under perfect control. The patient walks strongly, easily and *smoothly*, never complaining, even when questioned, of pain or fatigue.

Such treatment is not so quick, so easy or so striking as a successful resection. The progress is slow. It takes a great deal of the surgeon's and of the parents' time and personal attention. But I claim that in this case, and in many others, the final result will repay the extra trouble.

In the cases of resection that I have examined the foot has seemed to me rather clumsy and with but little motion. The patient has little or no control over it. Consequently the patient instead of walking with a natural "heel-and-toe" action, must *stump* upon it. Often for a long time they complain of some pain in the foot if too freely used.

This is very natural, for in an average case the entire articulation with the leg, consisting of the astragalus and the tips of the tibia and fibula, is removed, leaving the weight of the body to be borne by the ends of the long bones resting directly upon the os calcis, probably also upon the scaphoid and cuboid. A pretty firm union is formed, but there is no true articulation. The whole arch of the tarsus is undoubtedly weakened.

From the mobility of an ankle successfully treated by conservative methods it seems to me that the repair of the articulation must be more thorough than one would expect from the study of pathological specimens. Indeed, all caries of bone has a stronger tendency toward self-limitation and repair than many of us realize. The reparative

power of periosteum, of cartilage, and of synovial membrane seems to be less, but it may be greater than we suppose. Well-treated cases do not often appear among pathological specimens.

I believe few surgeons claim that the result of resection is any better than that of conservatism when successful. But they consider the results of resection far more certain. There I differ from them, if the conservatism be properly and thoroughly carried out. The avoidance of suffering is another plea for resection. In well-treated cases there is usually but little pain. The dangers and difficulties of prolonged confinement are often exaggerated. Children among good surroundings and with proper care thrive surprisingly in confinement.

The long time necessary for a cure, and the amount of attention, both of the surgeon and of the parents, are often considered insuperable obstacles. Yet I have never met parents, whose position in society was comfortable, who were not willing to meet the surgeon more than half-way, and to do all that he asked. If the surgeon himself have not the patience to put such a case through, he should not make orthopedics his specialty.

I have been the pupil and the assistant of Buckminster Brown, and have seen in his practice what can be accomplished by such methods.

I do not claim that all cases should be treated conservatively. I do not wish to condemn resection, but only to restrict its use.

Dr. Henry J. Bigelow used to divide club-feet into two classes. "One class," he said, "can pay for treatment, and is cured; the other cannot pay, and is incurable." We have advanced a stage beyond this standpoint and can now give either class a serviceable limb; but the paying class can still command an excellence in the final result from which the poor patient is debarred by bad surroundings and lack of attention, and the hospital patient by lack of time.

For all such cases resection is *the* method, insuring them, as it does, a serviceable limb. But for the little girl destined to grow up a society belle, more is demanded. Her time in childhood is of little value, and should be sacrificed without hesitation, if by so doing the final result can be improved. The surgeon should labor to secure the very best possible result, the most finished, the most polished, so to speak. And I claim that such a result is most likely to be secured by intelligent, painstaking conservatism.

The cut shows the cast taken before treatment was begun, and the foot as it appears eighteen months after treatment was completed.

A REPORT OF EIGHTEEN CASES OF CHRONIC DISEASE OF THE ANKLE AND TARSUS, WITH OBSERVATIONS UPON THE OPERATIVE TREATMENT.

By CHARLES L. SCUDDER, M.D.,
BOSTON, MASS.

The operation of excision of the ankle-joint or bones of the tarsus for disease is not a very old one. Moreau, in France, first performed a total excision in 1792. Thomas Welles, of South Carolina, first removed the astragalus for disease in the United States. Dr. Samuel Cabot was the first to remove the astragalus for disease in Boston, in September, 1859. Just ten years later (in 1869), the Children's Hospital, of Boston, began its records, and from that date to this, there have been performed fifty-four operations for diseased bone in the foot, including both partial and complete excisions of the ankle, and removal of portions of the tarsus.[1]

Many of the fifty-four cases could not be found. In some instances the hospital records were too meagre to be of service. All recent and unhealed cases are purposely omitted. With these exceptions eighteen cases remain in which the *ultimate* results are known.

The number of cases I have to report is few, but relatively it is large. There are in literature, beside isolated cases, those grouped by Hodges,[2] Culbertson[3] and Connor.[4] These tables bring together all reported cases up to 1883. One must be very cautious of conclusions reached from a study of so few cases. For this reason I have prepared the individual histories, that those interested may have the material from which these observations are made.

[1] Through the kindness of the visiting surgeons at this hospital, Drs. Bradford and Cabot, I am allowed the use of this material.

[2] Excision of the Joints.

[3] Prize Essay, Amer. Med. Assoc., 1876.

[4] Trans. Amer. Surg. Assoc., vol. i.

It is generally believed that chronic disease of the ankle and tarsus, especially in childhood, is of tubercular character. Investigations during the past nine years have demonstrated that the tubercular processes in the body are of parasitic origin, due to the presence and growth of a bacillus.

According to our understanding of the nature of the processes associated with the life-history of this bacillus, will be our treatment of the symptoms arising. Two views are maintained:

1. The bacillus of tuberculosis is short-lived and perishable, and its action may entirely cease. It is dependent for its vitality upon transitory conditions, which can be removed or counteracted. When this is the case, and its products are gotten rid of, the tissues then undergo repair.

2. Tuberculosis is a malignant process. It tends to the destruction of tissue, and to be disseminated throughout the body, causing a general tuberculosis.

There are likewise two classes of orthopedists, broadly speaking: *the one* uses mechanical means to the exclusion of operative procedures; *the other* considers apparatus as of secondary importance.

In the treatment of chronic disease of the bones of the ankle and tarsus, the methods hitherto in vogue are either mechanical or operative; the so-called expectant and radical methods—according as the surgeon in charge regards the tubercular process as benign or malignant.

The expectant method proceeds about upon the following plan:

1. If the joint is inflamed, let it have complete rest.
2. If an abscess forms, open it.
3. If *loose* bone is detected, remove it.
4. If the foot has assumed a malposition, rectify it.
5. Attend carefully to the general health.

Dr. Gibney, of New York, has reported favorably upon thirty extremely interesting cases of ankle and tarsal disease in children treated by this method, and concludes, judging from Culbertson's statistics collected prior to 1876, that excision is not attended with as good results as has been supposed, and is rarely justifiable; that partial excisions offer no advantages; and that the expectant plan of treatment gets more perfect results, more useful limbs, than any

other known method of treatment. These are conclusions reached some ten years ago, and held at the present time by many.

There is to-day a strong and growing tendency in favor of every possible application of the principles of conservative surgery. With the advent and adoption of modern methods of wound treatment the term conservative surgery has come naturally to include procedures hitherto unwarrantable. The older (so-called expectant) methods defined above are now ultra-conservative; and the term conservative is found to embrace operative measures once frowned upon.

From a consideration of the cases here reported I feel convinced that the old expectant treatment is not the very best conservative surgery. Its methods are certainly of great value, and hold important places in the treatment of chronic ankle-joint disease. In some instances it accomplishes all that is required; but it is not devoid of danger. The reports of isolated cases seem to demonstrate to some that nothing more is to be desired; but to regard it as a system of treatment, complete and distinct from all other methods, is to sacrifice the well-being of many a patient to an arbitrary and yet unproven theory.

In the light of to-day's improvements a decided advance has been made in the treatment of chronic ankle and tarsal disease. The means enumerated above under the expectant method are to be used; and one other procedure is to be introduced under proper conditions, namely, the removal of *all* the *diseased* bone, and, if a portion of a small bone is involved, the removal of that entire bone. I wish to emphasize the importance of this latter step, for it has been neglected. It should not be held in reserve, and be restricted to the practice of a few surgeons, but should enter the mind of every orthopedic surgeon as naturally as arises the question whether fixation can be obtained in certain cases without traction.

It is a clinical fact that tuberculosis of the ankle-joint at times appears most malignant. The foot and ankle seem suddenly to go all to pieces, in spite of expectant methods. The attack by the bacilli is most virulent. Then, again, there are mild cases, benign in character. Until the indices of malignancy are more readily recognized than they are to-day, and until the ultimate results of all methods of treatment are better known than at present, treatment will continue much the same. Meantime the following reasons

occur to me, upon a study of these cases, why the removal of the diseased bone should be accomplished more often, earlier, and more thoroughly than hitherto in this particular joint.

(*a*) A partial operation is of little value. The more bone that is removed the more closely does the wound resemble a simple one in healing. After the removal of the diseased portion, a cavity is left to be filled with granulation tissue. Under our present methods this tissue should appear without the formation of pus, with no septic fever, without *any* constitutional disturbance, and in a short time. Instead of waiting for nature to excise the joint in her slow and oftentimes imperfect fashion, the knife does a complete extirpation of the disease.

In the small spongy bones of the tarsus inflammatory infiltration occurs often rapidly. To check its progress with absolute certainty, all disease should be removed. If one bone of the tarsus becomes inflamed with an *advancing* tubercular process, it is as dangerous to the remaining bones to leave it, as it is dangerous to the life of the individual to leave the limb in whose distal part is the appearance of carcinoma. The fact that certain cases run a smooth course is no reason for in all cases using the simpler means.

(*b*) Gouging and the burr-drill are not sufficient. They are blind methods when used about the ankle and tarsus. No one can tell whether the edge or the centre of the disease is hit upon. It may, by chance, be all removed. Hard bone may be reached in one part, but in a direction not expected or in a bone not examined: or even in the portion of bone left there may, and very likely do, exist traces of the disease which act as foci for further development. If the surgeon finds hard bone, even then a danger may be introduced. New bone tissue being opened, the diseased tissue and débris that must inevitably remain after such a proceeding serve to inoculate the freshened area, and what was apparently gained is lost.

The histories of many of the cases here reported freely illustrate this fact, namely, the worse than useless gougings at the tarsus. (See Case No. 9.) Recurrence after partial operations is the rule. After gouging, new abscesses form, more fever, loss of appetite, and malaise appear. Another gouging, with the some result. Healing is protracted. Each time danger of general tubercular and septic infection is present.

The objections to the burr-drill and curette at the ankle and tarsus are: Valuable time is lost; very little is actually gained; there is danger of sepsis; there is danger of tubercular infection; it is a blind procedure for which there is a better method; recurrence of the disease is almost certain to take place.

(*c*) The duration of the disease and the period of healing are much shortened.

Gross, of Philadelphia, thought that, if the astragalus was diseased, an amputation was indicated; for a long time would be consumed in healing, and the foot could be of no service.

In the cases here recorded, in which the diseased bone was removed at the first operation, and in those cases in which the diseased bone was removed *en masse* after many curettings, the average period of healing was about five months. The average duration of the disease in these cases treated by early operations, was a little over one year. In those cases where the so-called expectant methods were alone used, the average healing period was about 16.7 months. The average duration of the disease in these cases was almost three years. In Gibney's cases the average duration of the disease was about three years and three months by the expectant methods. (See Table I.)

TABLE I.

	Expectant.	Radical.
Number of months healing	16.7	5
Duration of the disease	36.	12

Even the cases of excision of this joint reported by Dr. Hodges, eighteen in all, healed in about nine months, before the days of antiseptic surgery.

The question naturally arises, What is gained by waiting sixteen months, when the same end, and often a better, may be obtained in one-third of that time?

(*d*) Those objecting to total removal of the diseased portion, seem to think that there is something unscientific and unsurgical in mutilating, as they say, the foot—let it alone, and heal the disease, without removal. This is far more satisfactory and to be desired; it is more praiseworthy, and requires a delicate adjustment of apparatus to meet the existing conditions.

I cannot agree with Howard Marsh,[1] in one of his recent lectures,

[1] British Medical Journal, August 3, 1889.

where he likens the removal of the diseased bone to the removal of a tumor of the testicle, saying that the surgeon *removes* the diseased part for he cannot heal the disease *in situ.* The analogy leaves in one's mind an entirely wrong conception. In the case of the tumor, nature makes no attempt at removal. In the case of the diseased bone, nature's method is to remove that bone, either by absorption of the inflamed area or by liquefaction and discharge through sinuses.

The surgeon, by excision, merely interprets nature's need, and assists her. There is no mutilation of the foot. Nature's method should be the surgeon's method. The surgeon's method should be the natural one. One should recognize the moment when nature demands an excision.

(*e*) The time of after-treatment is diminished. By the expectant method an abscess opens or is opened, and suppuration continues. Much care is needed to keep the wounds aseptic. A long time often elapses before healing seems to be complete, and even then another abscess may form and discharge. If the bones are excised, the suppurative process ends. The wound heals as a simple one by granulation. Then there is the short period of protection of the joint and the prevention of deformity following perfect healing.

(*f*) The general health, as a rule, improves rapidly after the removal of all the diseased bone. When any portion is left behind, abscesses form, fever, loss of appetite, and failing strength appear. The general health may be taken as an index to the local process in the joint.

One has heard much of getting the patient into condition to operate. The general condition is not likely to improve by delay. Operate immediately and improvement will take place much more rapidly. Let the operation be the first step toward improvement.

(*g*) There is less risk of septic infection. Tubercular sinuses, foul pus, œdematous tissues offer suitable soil for the germs of septic disease. This is a danger to be considered. A clean wound well dressed offers less danger from this source.

(*h*) If it can be proved that the danger of tubercular infection disappears with the removal of the primary focus, much will have been gained, and a strong reason will exist for the early removal of the diseased bone. Before this can be established, it must be deter-

mined whether or not the very operation for removal of the diseased tissue does not hasten the spread of tuberculosis.

To this end an important question must be answered: What is the relative mortality of non-operative and operative cases from tuberculosis? Sufficient clinical material has not yet been collected to answer this satisfactorily. There will always remain the doubt as to whether the ankle disease is the only local manifestation of tuberculosis—whether there may not be a cheesy tubercular gland, or even an active tubercular process from which infection may take place after the removal of the only apparent focus at the ankle-joint.

As has been already suggested, there cannot be much doubt that curetting the ankle-joint is dangerous. Veins are opened; tuberculous material is stirred up; and the history of some of these cases bears witness to the probability of death from tubercular infection after this proceeding. It is reasonable to suppose that a clean-cut excision—all tuberculous material being removed even in the soft parts, and the wound thoroughly sterilized—should offer less risk of inoculation than a partial operation by the curette.

Of these eighteen cases, six have died—five from tubercular meningitis and one from septicæmia or shock.

No. 1 died one year after the operation.

No. 2 died a few days after the operation. Symptoms of tubercular meningitis are thought to have been present before the operation, and to have developed very rapidly.

No. 3 died two years after the operation.

No. 4 died four months after the first operation, and a few weeks only after the last curetting. The wounds had not quite healed.

No. 5 lived but two days after the operation, with a gradually rising temperature and sudden heart failure.

No. 6 lived three or four months after the operation.

Nos. 1, 3, and 6 certainly lived long enough after the operation for one to suppose that it was not a factor in hastening death. On the other hand, Nos. 2, 4, and 5 suggest the possibility that inoculation took place at the time of the operation, and hence the fatal meningitis.

The average age of those who died was four years. The youngest

was one and one-half years. The oldest was twelve years. (See Table II.)

TABLE II.

No.	Age (years).	Time of death from first appearance of disease.	Last operation before death.	Condition of ankle at death.	Cause of death.
1	3	1½ to 2 years.	1 year.	Healed.	Tubercular meningitis.
2	2¼	1 year.	2 days.	Not healed.	Tubercular meningitis?
3	12	2½ years.	2 years.	Healed.	Tubercular meningitis.
4	3	1 year+.	Few weeks.	Not healed.	Tubercular meningitis.
5	4	5 months.	2 days.	Not healed.	Shock?
6	1½	Few months.	Few months.	Not healed.	Tubercular meningitis.

(*i*) The end results in all cases have been good. Most of the cases reported have been at first treated by the expectant method, and later by operation. The improvement from the time of operation in all cases has been rapid and continuous. The disease in the foot, except in one instance, was ended by the operation. An ankylosis of this joint is not desirable, and in none of the cases has it occurred. The degree of flexion and extension of the ankle-joint is slightly greater in those cases excised than in those treated expectantly.

(*j*) No serious deformity has occurred in any case. Increased motion at the various tarsal joints seems to compensate partially for any loss of motion at the ankle. Operative interference does not increase the danger of ankylosis from ankle-joint disease. Atrophy of the thigh, calf, and foot is present in all cases measured, but not in proportion to the amount of bone removed.

Mr. Howard Marsh, in a recent lecture, used the following words regarding the *immediate* results of excision of the larger joints: "They will be so good, indeed, especially when the operation is performed early, that unless the results to be obtained *without* operation are kept well in view, excision will, as I venture to think, be much too commonly performed. The main defect of excision will lie in the ultimate result as regards the usefulness of the limb, when this

is compared with a limb in which no operation has been performed. In short, when one of the principal joints of the lower extremity has been removed during childhood, the patient has been seriously crippled."

The results of the cases reported here speak eloquently for an excision of the diseased part. The main *value* of an excision, not its defect, lies in the ultimate result, and in the relative shortness of the time that it can be obtained. The immediate result of an excision must to-day necessarily be *brilliant;* it is the result after years of use that is of *value.* This result is presented to you in several of the reported cases.

(*k*) The mortality from the operation is not great. Two deaths occurred from eighteen cases.

(*l*) The prognosis as to usefulness and time for treatment in operative cases is much more certain than in cases treated expectantly; for it is possible "to transform successfully a regressive metamorphosis into an acute reparative lesion." An exchange is made of an uncertainty for a certainty.

(*m*) The extent of the disease does not contraindicate an operation for its removal. Connor has twice removed the whole tarsus in men aged respectively thirty-nine and twenty years. The usefulness of the foot was good. In each case the legs were slightly shortened and the feet were two and one-half to three inches shortened. Four other cases are reported—one by Dr. Cheever, of Boston—in which almost the whole tarsus was removed successfully. Here, then, is a tremendous gain for the value of this operation.

(*n*) Profuse suppuration is checked by the operation. Hence is lessened the danger which arises from long-continued suppurative processes.

It has generally been thought that amyloid disease of the viscera is rarely associated with suppuration of the joints as small as the ankle. One of the cases reported here is dying from amyloid and chronic parenchymatous nephritis. The œdema of the legs is great, and the ascites is so marked that the liver cannot be mapped out.

Connor reports 108 cases of ankle-joint disease. Of these, eleven died. The cause of death was known in eight cases; and of these eight, four died from amyloid disease.

Long-continued suppuration is not to be encouraged.

The careful after-treatment of operative interference at the ankle-joint is as necessary as is the proper care of club-foot after operation. Every step is of importance. An antiseptic dressing should be applied to an aseptic wound, with even compression from the toes to the knee. Then follow absolute fixation of the ankle and foot, which implies fixation at the knee-joint; the position of the foot on the leg at a right angle; the position of the whole leg elevated for the first forty-eight hours. After the first few dressings, the child should be up and about on a Thomas splint or its equivalent, out-of-doors in the sunshine and open air. Each change of dressing should be as carefully done as the original dressing, and as infrequently as is necessary, being guided by the temperature and the comfort of the patient and the progress of the wound.

Before operation is decided upon, several facts should be considered, which assist in determiming the presence or absence of malignancy:

1. What is the age of the patient? Tuberculosis is active between the years three and nine.

2. What has been the duration of the disease? It may be about to quiet down.

3. What has been the treatment? Have the various expectant methods been given a proper and fair trial?

4. What is the family history as regards tuberculous disease?

5. What is the present appearance of the part? Is there a fluctuating swelling? If this contains pus, is it probably a residual abscess? If so, is it likely to become absorbed if left untouched, or to disappear if simply aspirated?

6. Is the disease progressing?

7. What is the general condition of the patient?

8. Is the patient of poor or rich family? The question of time or expense is an important one.

Upon the first appearance of malignancy, an excision should be done; in other words, excision of all the diseased bone should be resorted to earlier than hitherto.

The operative treatment of this disease is not advocated as a system of treatment. An attempt has been made to determine its proper place as one of the methods of a broad plan of treatment, which includes: (1) the proper use of all expectant methods; (2) the con-

stant study to determine the earliest signs of malignancy. If the case is assuming a malignant character, or there is doubt, then let the disease be excised. The advantages of an early excision have been already considered.

From a consideration of the cases reported above, the following conclusions may be safely drawn:

Excision is safe.

The mortality is not great.

The convalescence and time of after-treatment are short.

The disease in the foot is ended.

The prognosis is sure.

Profuse suppuration and its consequences are avoided.

The likelihood of septic infection is at a minimum.

The partial operation of curetting is of very little value.

There is no mutilation of the foot.

The usefulness of the ankle and foot is very great after excision.

The question of tubercular infection from operative interference is yet unsettled; but there is a strong presumption that partial operations of curetting favor infection.

Case I.—R. S., three years old. Family history good. A pale, delicate, fair-haired child. Injured right foot while playing, catching it in a hole in the sidewalk. Limped for a few weeks, and a swelling appeared over right ankle. In November, 1879, this was opened and poulticed for two months, discharging freely, when another swelling appeared on the inner side of the ankle, which opened spontaneously. In February, 1880, the whole astragalus was removed through the lateral incisions. The wounds healed, and in May, 1880, the boy was walking on his foot, well.

In 1881, the ankle had remained healed, and the boy had had fair use of his foot and ankle. Then he was sick with increasing drowsiness and stupor, and in a convulsion he died. Probably death from tubercular meningitis.

An immediate response to the complete extirpation of the diseased bone, even in a puny child.

Case II.—J. R., two and one-quarter years old. Family history phthisical. In August, 1879, the right foot began to be swollen over the outer side below the malleolus. A little bone was removed. Wound closed in a few months. August, 1880, astragalus was curetted, ankle-

joint was not opened. Two days later child developed very rapidly symptoms of what was supposed to be tubercular meningitis, and died.

Tuberculous material was stirred up by the curette; child then died.

Case III.—C. L., twelve years old. Family history phthisical. In September, 1884, a swelling began about the right ankle after a sprain. In February, 1885, the abscess was opened by incision on the outer side of foot. A few days later an incision was likewise made on the inner side of ankle and pus evacuated. A sinus on the thigh admits a probe to dead bone. In April, 1885, openings were enlarged, and carious bone was removed from the external cuneiform and the cuboid. In May, 1885, the cuboid, the two outer cuneiform, and the head of the fifth metatarsal bone were removed, and the cavity remaining scraped. In June, 1885, foot again swollen and very painful. An incision allowed much pus to escape. In July, 1885, the metatarsal bones on the outer side of the foot were scraped. In August, 1885, a fluctuating swelling was incised over the dorsum of the left hand. In October, 1885, patient got about with a Thomas knee-splint. In December, 1885, a new sinus opened on leg, one and three-quarters inches up the shaft of the tibia. Only a slight discharge from the ankle sinuses. These eventually closed.

No note is made until, in March, 1887, the patient died of tubercular meningitis.

The fact that continual scrapings are called for, is evidence that all the diseased bone is not out. The child was tubercular throughout, apparently.

Case IV.—B. B., three years old. In February, 1886, some swelling and lameness were first noticed about the right ankle, a little anterior to and below internal malleolus. Much pain upon deep pressure. Boy walks with short, quick limp. Motions of flexion and extension at ankle are limited and painful if forced. Some muscular spasm on forced flexion. One-half inch atrophy of right leg, one-eighth inch atrophy of right thigh, and one-fourth inch shortening of right foot, six months after noticed the first symptoms. In October, 1886, the astragalus was removed by lateral incisions. Drain through the joint. Posterior wire splint. In February, 1887, almost healed. Sinuses curetted. A few weeks later he died of tubercular meningitis (?).

The length of time of healing was short. After a curetting, he died.

Case V.—A. H., one and a half years old. Family history phthisical. General health good. Strong child. In July, 1888, right ankle first swelled. The left elbow became swollen later. In December, 1888, the os calcis was removed, and the parts remaining thoroughly curetted.

The olecranon was also removed with bone forceps. The child had an increasingly high temperature, and died two days after the operation.

Nothing mentioned regarding any signs of tubercular meningitis. Death due to septicæmia, possibly.

Case VI.—F. S., four years old. Ankle of left leg swollen for several weeks; much pain; lameness.

In February, 1887, left foot one-quarter inch shorter than right, and the left calf one-half inch smaller than the right. Kocher's operation done. The astragalus was removed, and the top of the os calcis was scraped. An antiseptic dressing was applied, and the foot done up in a large mass of cotton, covered with plaster-of-Paris bandage. In April, 1887, not all healed. A few weeks later boy died, of what was supposed to be tubercular meningitis.

Case VII.—P. M., three and one half years old. Family history good. Boy always pale and puny. For several weeks right ankle-joint was swollen and very painful. In June, 1887, Kocher's operation was done, and the astragalus was removed. Peroneal tendons were cut, and wound closed with a bone drain. Large antiseptic dressing. Plaster-of-Paris bandages outside of everything. In July, 1887, only a slight discharge from the sinuses in seat of wound.

At present sinuses are open. Chronic parenchymatous nephritis, with amyloid disease, probably. It is unusual for amyloid disease to appear in patients suffering with chronic ankle-joint disease. Usually it is associated with suppuration elsewhere. The amount of motion on flexion and extension is 26° less in the diseased side than on the well side.

Case VIII.—J. D., aged fourteen years. Nine years ago there were much swelling, redness, and tenderness of the left ankle-joint. An abscess opened spontaneously under the external malleolus, discharging a dirty pus. The treatment of this joint covered a period of about seventeen months, and consisted in a stiff bandage with steel upright. Child allowed to go about on foot. Posterior wire splint with rest in bed. Poultices. Several repeated incisions of abscesses and scraping the carious bone. Finally, after ten months, the joint was excised. The astragalus was removed entire. The upper surface was gone and in its place soft granulation tissue. The lower surface was very soft. An iodoform seton, antiseptic dressing, and an anterior plaster splint applied. After seven months, child used foot.

At present, nine years after the disease began, there is atrophy of one-half inch of left instep, one and one-half inches atrophy of left calf, and several inches shortening or atrophy of left tibia. The foot

is useful. There is but a slight limp. The range of motion in flexion and extension is 45° less in diseased foot than in well foot.

Case IX.—F. G., nine years old. Mother died of phthisis. A lump was noticed on the outer side of ankle. For two years this gradually increased in size. Six years ago child came under observation. The lump had just opened spontaneously with a discharge of pus. The surface of tibia articulating with the astragalus was scooped out, and the astragalus was left as a shell of bone. Four other operations were done at intervals of a few months, each time a little more carious bone being scooped out. For one year after the last scraping the sinuses remained open. He was treated from May, 1883, until July 1885, twenty-six months before the sinuses healed.

At present, six years after the disease began, there is slight atrophy of the calf, thigh, and foot of the diseased side. The foot is useful, and yet there is some pain at times after using it. There is some deformity of the left foot, due to long use, which can be corrected with proper care. The amount of flexion and extension is shown in the Table.

Case X.—E. H., aged twenty-two years. In 1876, he walked lame. In 1878, an abscess appeared behind the inner malleolus, and later a second opening appeared behind the outer malleolus. In 1879, the abscess of ankle was incised. Bone curetted thoroughly. In January, 1880, there was a slight discharge from sinuses and he was unable to bear any weight upon the foot. About three years after he left the hospital, the sinuses ceased to discharge. He has never worn any apparatus.

At present, thirteen years after first lameness, walks with a cane. Has some morning stiffness in ankle. Limps considerably. There is much eversion of the left foot. The left leg and thigh are considerably atrophied. Right instep, 12¼ inches; left instep, 11¾ inches; right leg, 36 inches; left leg, 33¾ inches; right tibia, 15¼ inches; left tibia, 14½ inches; right calf, 14 inches; left calf, 11½ inches. Has a useful foot. The range of motion in flexion and extension is 8° less on the lame side than on the well side.

Case XI.—W. G., eighteen years old. In August, 1880, injured foot. A swelling appeared on the inner side of ankle and also a little in front, as far forward as the metatarso-phalangeal joints. In January, 1881, swelling was incised and pus evacuated. In February, and again in March, incisions were made and bones removed. At one time the proximal end of the second metatarsal bone was removed. Posterior wire splint. Stiff bandage applied later. May, 1881, healed.

Now, after nine years, has a useful foot. Amount of motion in flexion and extension is 31° less in the diseased side than in the well side. The right calf measured one and one-half inches less than left; the right thigh measures one inch less than left. Boy limps a little when walking.

Case XII.—M. M., thirteen years old. In October, 1881, noticed a swelling of great tenderness on the inner side of ankle-joint. In November, 1881, abscess aspirated and later opened. In January, 1882, sinuses enlarged. In March and May, 1882, other incisions were made. Bone scraped clean. Antiseptic dressing. In August, 1882, almost eleven months since first detected, swelling has healed completely.

At present has a useful foot. Does not favor this foot. The right calf shows one inch atrophy, and the right thigh shows three-quarters of an inch atrophy. Limps a little when tired. The amount of motion in flexion and extension is 8° less in diseased side than in well side.

Case XIII.—W. E., aged seven years. Good family history. Good personal history. In January, 1884, a swelling was first noted in the inner side of the left ankle. In March, 1884, the left foot over the astragalus and cuneiform bones was swollen, hot and tender, with some slight redness. A plaster bandage had been on the ankle from January to March. In March, 1884, abscess was opened and thorough curetting done. In May, 1884, two small sequestra were removed from the inner anterior edge of the astragalus. In July, 1884, ankle swollen. Poulticed. In August, 1884, another thorough curetting. In January, 1885, sinuses ceased to discharge. Healed.

At present has a useful foot. Amount of motion in flexion and extension is 41° less on the diseased side than on the well side. The right calf measured eight and three-quarters inches; left calf, seven and one-quarter inches; right thigh, ten and one-quarter inches; left thigh, ten inches. Length of leg from anterior superior spine to internal malleolus is the same. The left foot is five-eighths of an inch shorter than the right one.

Case XIV.—C. H., aged twelve years. Family history bad. In July, 1885, she thought she had sprained her right ankle. Complained of lameness and a slight swelling about the right ankle-joint. Had no pain at first. In February, 1886, general condition good. A slight limp in walking. Moderate fulness behind the internal malleolus. No pain; no tenderness; no impairment of motion. Right instep measured eight inches, left instep eight and five-eighths inches. A plaster and caliper ankle-splint was put on in April, 1886, and was worn for a little

while. The swelling diminished and the ankle seemed to be improving. The ankle got so much better that she left off the splint and in the course of three weeks the ankle became worse again. In February, 1887, the astragalus and the two malleoli were removed by lateral incisions. Antiseptic dressing and complete fixation of the ankle. Ankle healed under the protection afforded by a Thomas knee-splint.

At present the foot is a useful one. Movements in flexion and extension are 14° less in the diseased foot than in the well foot. The right calf is smaller than the left. The right thigh is smaller than the left.

Case XV.—I. B., aged eight years. In February, 1886, began to be lame. Swelling appeared over ankle-joint anteriorly. Lameness and pain in left ankle steadily increased. Rest in bed. Thomas knee-splint. August, 1886, astragalus removed by the two lateral incisions. Antiseptic dressing and perfect immobilization. At the end of February, 1887, the wound healed. Used Thomas knee-splint a little after, and then began to walk on the foot.

At present, foot is in good condition and very useful. A slight limp only. Atrophy slight. The angles of flexion and extension were not obtained.

Case XVI.—W. M., aged nine years. In March, 1885, sprained left ankle. Pained him because swollen, and he limped for some time. In September, 1885, an abscess opened near the ankle. In August, 1886, the left astragalus was incised by the two lateral incisions. In February, 1887, the ankle was about healed.

Boy not seen since 1888; but then the ankle was healed, and he was using the foot.

Case XVII.—G. L. F., aged six years. For a year without much of any treatment; the boy had trouble with the left ankle-joint, having had for a longer time chronic inflammation of the left knee-joint. September, 1886, the astragalus and lower ends of tibia and fibula were removed, and the curette poked up into the tibia removed a cheesy focus. The usual antiseptic dressing, with complete fixation, was maintained; and in January, 1887, the foot was healed solidly.

One year ago the foot was still in good condition, but not used much because of the disease in knee which had not completely healed.

Case XVIII.—E. W., three years old. Family history unknown. Child sprained the right ankle and soon a sore appeared on outer side of ankle, discharging pus. Examination found a marked swelling on right ankle, with great heat of skin and redness. Several sinuses on the outer side of ankle. Foot two-thirds extended, and much diminu-

TABLE III.

No.	Sex.	Age.	First symptoms.	Cause.	Operation.	Result as to Life	Result as to Usefulness	Cause of death.	Time after last treatment when examined.	Atrophy in inches. Thigh.	Atrophy in inches. Calf	Atrophy in inches. Foot	Arc of motion. Well.	Arc of motion. Dis.	Condition of joint at time of death.	Number of months of expectant treatment.
									Years.							
1	M.	3	1879	Caries	Astragalus.	R.	Fair.	Tubercular meningitis.	.....	.....			.....		Healed.	.....
2	M.	2¼	1879	"	Astragalus and curetted.	D.	...	Tubercular meningitis?	.....	.....			.....		Not healed	.....
3	F.	12	1884	"	Cuboid; two outer cuneiform; head fifth metatarsal.	R.	...	Tubercular meningitis.	.....	.....			.....		Healed.	.....
4	M.	3	1886	"	Astragalus.	R.	...	Tubercular meningitis.	.....	.....			.....		Not healed	.....
5	M.	1½	1888	"	Os calcis; curetted.	D.	...	Septicæmia?	.....	.....			.....		"	.....
6	M.	4	1887	"	Astragalus.	R.	...	Tubercular meningitis.	.....	.....			.....		"	.....
7	M.	3½	1887	"	Astragalus.	R.	...	Dying; amyloid.	.....	.....			.....		"	.....
8	F.	14	1880	"	Astragalus.	R.	Great.	.....	9	½	1½	1¼	46°	20°	.....	10
9	M.	9	1883	"	Expectant.	R.	"	.....	6	1	1¼	⅝	67	22	.....	26
10	M.	22	1876	"	Expectant.	R.	Fair.	.....	13	...	2½	1¼	47	39	.....	4–5 yrs.
11	M.	18	1880	"	Proximal end of second metatarsal.	R.	Great.	.....	9	1	1½	1⅝	45	14	.....	9
12	F.	13	1882	"	Expectant.	R.	"	.....	8	¼	1	½	46	38	.....	11
13	M.	7	1885	"	Expectant.	R.	"	.....	4	¾	1½	½	73	32	.....	12
14	F.	12	1887	"	Complete excision.	R.	"	.....	2	1	2	1	43	29	.....	Several.
15	F.	8	1887	"	Astragalus.	R.	"	.....	2	1	1½	¾	.....		.....	"
16	M.	9	1887	"	Astragalus.	R.	"	.....	2	.....			.....		.....	"
17	M.	6	1887	"	Complete excision.	R.	"	.....	2	.....			.....		.....	"
18	F.	3	1887	"	Portion of tarsus including astragalus.	R.	"	.....	6 mos.	Slight.			.....		.....	"

tion in power of flexion. Ten months after the sprain a portion of the tarsus was removed, the astragalus being left. Three months later the astragalus was removed. Ten months later discharged from hospital, wounds all healed.

Conditions six months after discharge: Slight atrophy of the thigh, leg, and foot. Walks with slight limp. Movements at the ankle-joint as good as in the well foot. The child has grown rapidly and is of healthy appearance.

Table III. on the preceding page is given to show at a glance the list of cases here reported.

DISCUSSION.

Dr. V. P. Gibney, of New York.—We owe Dr. Scudder many thanks for his paper this afternoon, and for bringing so large a number of patients before us. We all know how difficult it is to get them together for such a demonstration. I should like to comment favorably upon the case of Dr. Foster, and in this connection I would like to say I am a firm believer in the treatment advocated by him for children. I may say also that the most disastrous results in the way of deformity in children that I have ever seen have been after operation by complete excision. I may also say I have never seen any great deformity that was not easily corrected after the expectant plan of treatment. I have seen one or two cases of death from septicæmia. I have long since believed that, if we take those feet where sinuses exist and put them in good condition, and avoid traumatism, give the patient plenty of exercise and cod-liver oil, we will get excellent results. I have seen such an array of cases as Dr. Scudder has shown this afternoon treated by the expectant plan—I have seen the patients ten years after: they were able to dance, to skate on rollers, and to walk along the street in such a manner that it would be difficult to tell which was the limb affected. This statement may seem extravagant in this era of operative surgery, but I can vouch for every assertion I make. I have no anxiety to exaggerate. The argument has been raised that we save time by such a procedure. Gouging out a sinus or the diseased portion of a bone tampers with the patient as has been claimed by good authority, and you may get worse results by meddlesome surgery. So far as looking upon it as a tubercular process, I have long since reached that stage in my observations, and I am perfectly willing that

these tuberculous processes go on indefinitely (if such they are) in children without excising or removing the parts.

Dr. Newton M. Shaffer, of New York.—I do not know whether I am prepared to pass upon this question of operative interference in ankle-joint disease. I am sometimes struck, when I see patients at the Orthopedic Hospital, with the manifest advantages of operative interference; but in a great many cases—I may say in almost every instance—my judgment and advice are against cutting. I think I can reëcho Dr. Gibney's sentiments—I expect to see almost uniformly good results in ankle-joint disease without cutting. They are cases which give the least anxiety, and I am impressed with the idea, after the exhibition of Dr. Scudder's cases, and the bold manner in which they have been treated, that a certain number can be successfully treated by excision. I think, however, we should look more to what we may call the *ultimate result;* by this I mean the kind of feet these patients are going to have when they are about eighteen or twenty years old. I have watched similar cases long enough to know what the result will be if we let them alone and give them a chance under mechanical treatment.

I questioned some of the patients on one point. One or two of them said they had no pain, while others remarked they had pain when they commenced to walk after sitting down for a long time; in other words, there seems to be a vulnerable condition yet remaining in the osseous tissues, if there is not something worse. In looking forward it would be difficult to estimate the condition ten or twenty years from now. On the other hand, I have seen cases of ankle-joint disease where, after fifteen years, it would be difficult, without an examination of the foot, to determine that there had been any trouble at all. In my own experience I have seen a good many cases such as the doctor has outlined, and have watched the result, and I should not hesitate to vote decidedly in favor of simple treatment, especially where a proper mechanical appliance can be supplied, where traumatism can be removed from the articulation, and where the patients can walk about in the open air.

Dr. De Forest Willard, of Philadelphia.—I think that Dr. Scudder has certainly proved that time is saved in a certain extreme class of cases, and that it is an element which should be considered, especially with cases in hospital practice. He has also proved that we do have exceedingly useful and good working joints after excision, but I do not think he has proved that life is saved. On the contrary, I think the mortality shown is decidedly greater than it is in cases treated on the conservative plan. We see and know that in a very large propor-

tion of those cases which are treated by mechanical measures, rest, and fixation, we secure good results, with, in some cases, a slight ankylosis, but nearly always with good walking feet. The percentage of deaths from tuberculosis in the list given is exceedingly large, and it may be possible that the operation has assisted in disseminating the tuberculous bacilli.

There are certain cases of joint disease at the hip, knee, ankle, etc., that demand excision. There are others that come under our observation where it is difficult to determine when to use the knife and when not to use it. In cases that are rapidly growing worse, which are suppurating freely, and where the caries is evidently extending rapidly, I think there is no question but that operative interference is decidedly indicated. We will not only save time, but life as well. I am inclined to resort to excision in the worst class of cases, but those milder forms of ankle disease that go on satisfactorily I would reserve for mechanical treatment. The results will be better in three-fourths or four-fifths of the cases.

Dr. Phelps.—In regard to ankle-joint disease I am decidedly in favor of operative procedures in cases of progressive bone disease. I believe, however, that the majority of cases can be successfully treated by simple and conservative means, but I further believe that conservative orthopedic surgery to-day in many instances is best carried out by means of the knife. In cases of disease of the ankle-joint in which more than two bones are diseased, or extensive disease exists in one, I think it is conservative orthopedic surgery to operate. If we could be sure in cases of excision of the ankle-joint that ankylosis would be the result, I would be in favor of operating in a much larger per cent. of cases. In the class of cases where there is more than one or two bones diseased, I would open into the ankle-joint and with a scoop clean out whatever portions found diseased. After the astragalus is removed the os calcis may look perfectly healthy. But upon cutting through the cartilage the inside of the bone is frequently found diseased and filled with tubercular material. The operator should proceed from bone to bone. When the ends of the bones are removed there is tubercular material frequently found in the cancellated structure. That this class of cases is better treated by operative interference than by any other method as yet devised, I believe.

The mortality in these cases is not greater than in those treated by the so-called conservative method or expectant plan. The cavities of the bones should be allowed to fill with blood. If the periosteum has

been left a reproduction of the bones will take place by the organization of the blood-clot by replacement in about four weeks.

Dr. George W. Ryan, of Cincinnati.—I think the circumstances of the patient should determine very largely what we are to do in these cases of disease of the ankle-joint. In the case of poor children, where we cannot keep them long under our care and where treatment would not be kept up, we are often justified in resorting to excision. In the case of well-to-do families, where the surroundings are good, we can patiently await the results of the expectant plan of treatment, for it is in disease of this joint above all others that this plan, in my opinion, will give far better results than the operative treatment. Dr. Scudder is to be congratulated on the results obtained in his patients.

Dr. Sayre, of New York.—I have not much to add. I think if I saw these cases early I should treat them by the expectant plan, and an apparatus that would relieve the joint from the traumatism of reflex muscular spasm; but in that class of cases where the surroundings are not the best, going on from bad to worse, excision should be resorted to and all the diseased tissue thoroughly removed. A large majority of the cases if seen early will not go on to the stage warranting surgical interference, and we can get as good results by proper mechanical treatment as by operative interference.

Dr. A. J. Steele, of St. Louis.—I, in the main, agree with Dr. Scudder, though I would not go to such an extreme. For example, a girl aged nine years came to me from Texas with chronic ankle-joint disease and in a bad general condition from malarial fever. There were two sinuses which had been discharging for some time. No special treatment had been adopted. I made a well-fitting leather splint from a plaster cast, and applied it in the extended position in which the foot was at the time, treating the open sinuses antiseptically. Patten on sound foot, and crutches. In six weeks the sinuses were healed, the swelling had diminished, and the heat passed away. The girl has gone on improving, so much so that she is able to put her foot to the ground. Motion in ankle and no pain.

In another case, a child three years of age, with advanced ankle-joint disease, I made a free incision, removed all the carious bone and thoroughly washed out the cavity with antiseptic solutions, and put it in a plaster-of-Paris bandage, and the case has gone on well.

I would be guided by the condition of the case which fell into my hands. I would try the conservative treatment first, and if necessary, resort to more heroic measures later. I am not afraid of the tuberculosis becoming general from the local focus.

Dr. Homer Gage, of Worcester, Mass.—I think these cases of caries of the ankle fall naturally into two classes, viz.: those occurring in childhood and those occurring in youth and adult life—and that they require different treatment. In children the tendency of the best surgical opinion at present seems to be decidedly in favor of pursuing the expectant plan. But in youth and especially in adults it is, I think, the experience of almost all general hospitals that nothing short of very thorough removal of all diseased bones proves an efficient substitute for what is even then too often found necessary, viz., amputation of the foot. The cases which have just been reported illustrate very beautifully, I think, the advantages of a thorough and complete over a partial excision.

Dr. E. H. Bradford, of Boston.—In regard to the cases which Dr. Scudder has exhibited this afternoon, a large number of them, if not all, have occurred in his practice at the Children's Hospital of this city, and they are what may be called the "hospital class." In other words they are the class of patients that could not be treated conservatively—a class of patients where, owing to tenement-house surroundings or the drunkenness of parents, conservative treatment has been tried and has proven a failure. In these cases shown there is no question that the operation was justifiable. There may be some discussion as to the abstract question whether in general conservative or operative treatment is the better, but the results shown by Dr. Scudder demonstrate that the operation is frequently justified by success when other means have failed.

Dr. Scudder.—It seems Dr. Willard overlooked the cause of death given in the first classification. One of the cases died two days after and because of the operation, and another several days afterward, presenting the symptoms of tubercular meningitis, which probably existed before the operation was performed. In going back over the history of the last case the symptoms of tubercular meningitis were not recognized at the time or the operation would not have been undertaken.

Dr. Bradford has answered one or two points of inquiry as to the condition and circumstances of patients. These ten patients are simply presented to you for what they are worth. They are cases of excision. It seems to me they illustrate the fact that excision is *safe*, and that the results are obtained in a *short time*, and that the *usefulness* of the foot is great.

As to whether cases should be treated by a surgical operation, or by the expectant method, that of course is a question to be decided upon the merits of the case as it presents itself. If there is to be formulated

any mode of action, all cases should be given a fair trial with the expectant method, and we should watch carefully for the first indication of failure of that method, and *then* if operative interference is undertaken the results are surely good. I do not advocate the indiscriminate performance of excision of the bones of the ankle and tarsus. I have attempted, however, to present the advantages of excision in the strongest light possible.

If excision is undertaken the rule is that the result shall be good as to usefulness. *When* excision should be undertaken no fixed rule can state, but this much may be concluded with certainty, that the *earlier* the operation is done, after signs of malignancy are present, the better will be the ultimate result. It is therefore the imperative duty of the surgeon to study his cases with such care that he may detect the very first suggestion of malignancy. This has not hitherto been done.

Dr. Foster.—I think most of us try the conservative plan of treatment first, and then, should it fail, resort to surgical interference. I think no one will question the propriety of operating in these cases when the indications are such as to warrant it. The hospital treatment is bound to be different from the methods we would ordinarily adopt in many cases that come to us in private practice. If you have got a young girl, attacked with disease early, who is going to grow up in the best of society, you want to get the very best result possible in her case.

Drs. Gibney and Judson claim excellent results from the expectant method in a great many cases, and the operative treatment does no better than that. Dr. Judson brought out one point which is important, and that is, the proper position. If you want the part to do well, you need to place it in the best possible position.

Dr. Steele mentions one case where he did tenotomy, and then found it was not necessary. He had another case, and the contractures had not sufficient time to establish themselves. If he had a case that had been running a number of years, he would probably have to do tenotomy in order to get the foot in a good position.

REPORT OF A CASE OF CONGENITAL DISLOCATION AT THE HIP.

By JOHN RIDLON, M.D.,
NEW YORK.

D. K., female, aged ten and one-half years, came under observation February 16, 1888. She is the eldest of two children of healthy parents. When she began to walk, at fourteen months, she limped, and it was noticed that the right leg was shorter than the left. No cause could be assigned. She had never been hurt sufficiently to cry. Nothing had been done in the way of treatment; she was brought for advice about a high shoe.

Examination: She walks with a very decided limp; the right leg is rotated outward; the thigh flexed on the pelvis, and the lumbar spine is markedly lordosed. It requires a blocking under the foot of three inches to make her stand fairly erect. (Figs, 1, 2, and 3.)

Measurement: Anterior superior iliac spine to internal malleolus, right, 26¼ inches.

Anterior superior iliac spine to internal malleolus, left, 28¾ inches.

Great trochanter to external malleolus, right, 27⅝ inches.

Great trochanter to external malleolus, left, 27⅝ inches. The right great trochanter is two and one-half inches above Nélaton's line. The head of the femur cannot be made out; all movements at the joint normal, except extension and inward rotation. I suggested an attempt to increase the length of the limb by prolonged traction in bed, with the hope of eventually reducing the dislocation. Some months later, the family removed into town for this purpose.

Photographs (Figs. 1, 2, 3) were made by Dr. Ogden C. Ludlow, on February 24, 1888, and on February 26, 1888, the old pattern of the Taylor extension hip-splint was applied, and the leg elevated on an inclined plane. From this on, for one year, the child did not leave her bed, and no relaxation of the traction was once permitted. The inclined plane was lowered from time to time, and removed altogether

after about six weeks. During the first two months the elongation of the limb was rapid, an inch in length being gained in that time; afterward it was slow. After eight months, the tissues about the joint were thinned down sufficiently to make it possible to locate the head of the femur, which was found displaced upward and forward, lying almost

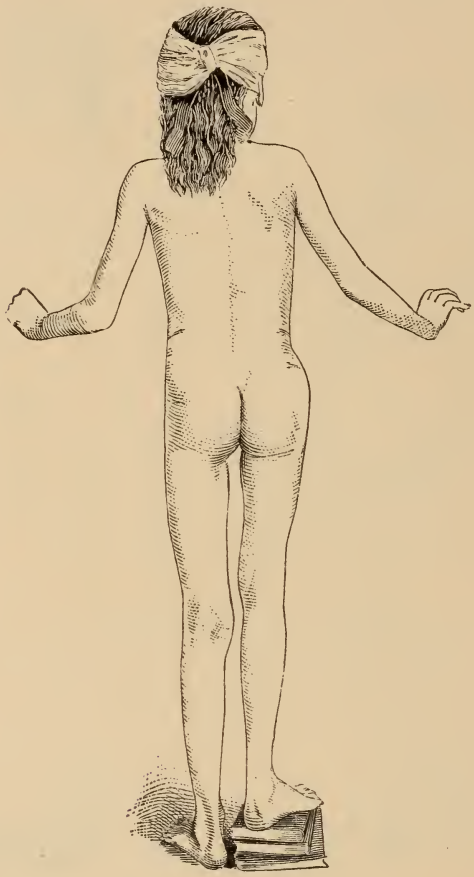
Fig. 1.

Fig. 2.

directly below the anterior iliac spine. This position was confirmed by Dr. Frank Hartley and Dr. L. W. Hotchkiss, who saw her with me in January of the present year (1889). The head of the femur could then be brought around directly over the acetabulum. To do this, however, it was necessary to rotate the limb inward a quarter of

a circle. It seemed as if, in the process of growth with the femoral head in the abnormal position, the neck had been twisted around to the front. As the parents would not consent to an operation, it was thought wiser to be satisfied with the increased length of the limb, without a reduction of the dislocation, than to attempt further to replace the

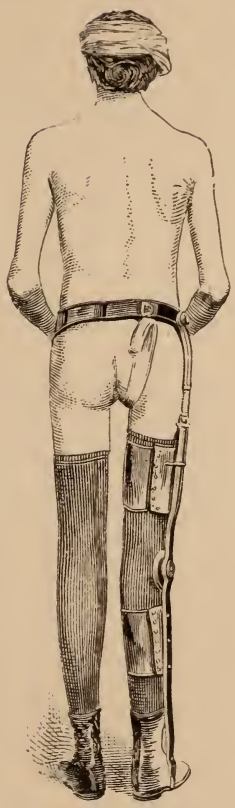
Fig. 3.



head, and thereby cause the foot to be rotated inward to a right angle with the other foot. To this end, then, a jointed splint was applied February 1, 1889, and the patient was allowed up. At that time the difference in the length of the limbs, as measured from the anterior superior iliac spine to the internal malleolus, was one inch. At the

Fig. 4.

Fig. 5.



present time this has been reduced to one-half inch. (Figs. 4 and 5, from photographs made by Dr. Ludlow, on September 2, 1889.)

This case is interesting, on account of the direction of the dislocation (I have not been able to find another such case recorded), and because so much improvement has resulted, though I was disappointed in not getting such a result as that obtained by Dr. Buckminster Brown, in his case reported in 1885.

DISCUSSION.

Dr. V. P. Gibney, of New York.—I would say I have had a traction splint on with a perineal arrangement made of steel, shaped to the child's perineum, that keeps up unremitting traction for nearly two years. In this case the limb was drawn down by manual traction; I have maintained it in that position ever since. I expect later on to put on a jointed Dow's splint to keep the limb in the required position until the dislocation will not occur.

Dr. Henry G. Davis, of Everett, Mass.—I would like to remark on one point in the discussion on dislocated hip-joints. In the treatment by continued traction, when the joint is brought into its place, the muscles upon one side have been elongated, while, at the same time, those upon the other side (which by the process are becoming loose) will be shortened in about the same proportion. So that, so far as the muscles are concerned, the joint is at rest or in the normal state. A splint should be worn for some time to secure against accidents.

I had a patient, four years old, with dislocation of both hips, the right forward into the foramen, the other upon the dorsum of the ilium. It was not known when the dislocations occurred. They were treated by continued extension until all the soft parts were elongated sufficiently to permit their reduction. Splints were applied to prevent their displacement. Another case of twelve years' standing was reduced in the same manner with good results. These reductions were accomplished without pain or any suffering.

Dr. De Forest Willard, of Philadelphia.—I would like to ask Dr. Ridlon whether he has yet tested the amount of fixation of the head of the bone that has been secured.

Dr. Ridlon.—In answer to the question by Dr. Willard as to the degree of motion at the joint, and the location of the head of the bone, I would say that in flexion, extension, abduction, and adduction, I have not tested the motion beyond what is permitted by the brace; and as to the vertical movement, the head of the femur has not been once pushed upward since the treatment was commenced. I have no doubt that it could be pushed upward somewhat beyond where it now rests; and I believe the resting place to be slightly above and anterior to the acetabulum. The leg has been elongated two inches (in proportion to the other leg), but I shall make no further attempt to replace the head of the femur in the acetabulum, and unless adhe-

sions form retaining the bone in its present position the patient will have to wear support all her life to maintain what has been gained.

Dr. Gibney.—Did the patient have a high shoe on the sound foot?

Dr. Ridlon.—No. She wears an ordinary shoe. When this splint was put on there was an inch difference in the length of the legs; now there is so little that it is not apparent in the photographs.

Dr. E. H. Bradford, of Boston.—It would be well for the Association to bear in mind other methods of treatment, as the whole subject is in an experimental stage. Excision has been performed with the results of a diminution of the functional usefulness of the limb, but with an improvement of position. Barwell has advised subcutaneous section of the muscles retaining the limb in a subluxated position, but he has had few if any followers.

Dr. Post, of Boston, has reduced the deformity with an anæsthetic, and kept the limb in a reduced position by a plaster-of-Paris bandage, which was worn for nearly a year—the case remained cured for some time—but subsequently there was a relapse of the deformity.

Dr. Bradford stated that he had a few cases still under treatment —but it was too early to pronounce as to the result.

THE ABSCESSES OF HIP DISEASE: THEIR PREVENTION AND TREATMENT.

By ROBERT W. LOVETT, M.D., and JOEL E. GOLDTHWAIT, M.D.,
BOSTON.

The treatment of the abscesses of hip disease is a question which has been widely discussed, and one upon which diametrically opposed views have been held. No figures bearing upon the relative value of the various treatments have yet been brought forward, and the debate so far has been largely confined to the assertion of personal opinion. As a general rule, surgeons have advocated the early incision of these pus collections wherever and whenever they form. Many of the leading orthopedic surgeons in America, on the other hand, advocate very strongly letting the abscesses break of their own accord unless their character is so acute as to render operative interference necessary. Their reasons for this are: first, the possibility that the abscesses may disappear spontaneously; secondly, that the operation has no effect upon the original disease to which the abscess is only incidental; and third, that there is a risk of septic infection due to operation. At the close of a discussion at the Orthopedic Section of the New York Academy of Medicine, held in the spring of 1880, the Chairman, Dr. Gibney, remarked that however interesting the discussion had been, it had led to no positive results, and that a previous discussion in the same section had been equally fruitless; and he called the attention of the members to the fact that the question could advance no further until some figures bearing upon the subject were brought forward.

In the hope of bringing to light some definite facts in the matter, the records of the Children's Hospital have been analyzed for the five years ending in 1888. Incidental to this investigation, such important facts were developed with regard to the condition of the occurrence of hip abscesses that the division of treatment which

relates to their prevention has assumed a much more prominent place in this paper than was originally intended.

We had for analysis several hundred cases of hip disease, which were under treatment in the surgical out-patient department of the hospital. In the five years ending 1888, three hundred and sixty new cases came for treatment to the out-patient department. Of cases continued from the year 1883, there were certainly fifty, giving at least four hundred cases which were under treatment in these five years. Taking from this number the eighty new cases which came in 1888, in whom abscesses perhaps had not had time to develop, we had three hundred and twenty cases under treatment at the out-patient department from 1883 to 1887 inclusive.

The operative treatment of hip abscesses has been pursued at the hospital, in these years, to the exclusion of every other method, so that every abscess occurring in these cases has been admitted to the hospital and operated upon. There have not been more than a dozen exceptions to this rule in these five years: so that the figures, whatever they may be, are thoroughly representative of the operative treatment. Aspiration of the contents of the abscesses has at times been tried, sometimes followed by the injection of iodoform and similar substances. In every case of this sort it has been ultimately necessary to open the abscess by a free incision.

In the five years from 1884 to 1888 inclusive, there were only seventy abscesses opened in the hospital; and as all abscesses were opened as soon as they become superficial enough to give evidence of fluctuation, this number represents approximately the total number of abscesses occurring in the three hundred and twenty cases treated in the out-patient department. The calculation cannot, of course, be more than an approximate one. A certain number of the three hundred and twenty cases disappeared from view without being under treatment for any length of time; but these were few, and, as a rule, not the worst class of cases, for the reason that there is no other large orthopedic clinic in Boston, and the cases which progress badly are almost sure to come to the Children's Hospital. The cases which are lost sight of are generally those in which the symptoms quickly subside, or in the long chronic cases where the symptoms never reach any very great severity. It is not as it is in New York, for instance, where the cases shift from one clinic to another. In Boston they

must come to the Children's Hospital or go untreated, so that the error arising from this source is necessarily a small one.

So far as the writers have been able to judge, the figures represent very fairly the total number of abscesses occurring in the three hundred and twenty cases of hip disease under treatment in the five years. Apparently, it is from a similar class that the statistics bearing on the frequency of hip abscesses collected by Gibney, Marsh, and the Clinical Society have been taken: so that it is perfectly proper to compare the percentage of abscess occurring in this series of cases with the statistics of those writers. In three hundred and twenty cases, then, we had in the neighborhood of seventy-five abscesses, making all allowances for error, which is a percentage of twenty-three.

Comparing, then, this percentage of twenty-three with the other figures relating to the frequency of hip abscesses, the writers were very much surprised to find that it was much smaller than any previously reported group of cases. In the series of cases reported by the Clinical Society's Committee, in 1880, of four hundred and one cases, sixty-nine per cent. developed abscesses in the course of a few years. Mr. Marsh, analyzing the more recent cases from the Alexandria Hospital (those from 1880), calculated that fifty per cent. of all the cases developed abscesses before admission, or during the course of the disease. The diminished percentage, which was so much smaller than the Clinical Society's series, he attributed to the improved methods of treatment; and, he added, "My own estimate, from what I have seen in the hospital and elsewhere, is that the formation of an abscess may be averted by early treatment in at least eighty per cent. of the total number of cases."

Of the eighty cases of cured hip disease reported by Gibney in 1878, where the expectant treatment had been pursued, forty-eight cases, or sixty per cent., had abscesses; and in the discussion following the reading of that paper, Dr. Yale stated, as the result of his own experience and that of others, that about fifty per cent. of all cases of hip disease develop abscesses.

The out-patient cases in the Children's Hospital series have been under treatment continuously, reporting once a month at the hospital. The method of treatment has been almost entirely by the use

of the long-traction splint, with crutches, and a high shoe on the well foot.

In all cases where deformity occurs in the leg, as soon as flexion or adduction or abduction reaches any noticeable degree, the patient is at once admitted to the hospital, and the deformity reduced by means of traction in the line of malposition, while the patient lies in bed, secured to a bed frame, with the leg elevated or abducted or adducted as the case may be.[1]

In the same way, children whose joints become acutely sensitive are not allowed to go about on crutches, but are at once sent to bed until the joint quiets down. Formerly the cases were allowed to go about till the deformity became so great that the splint could not be comfortably worn, and the proportion of abscesses at that time was larger than it is now.

The time required in bed for this reduction of the deformity is rarely more than a few weeks, and only a few days in the milder cases. Correction of the position of the limbs under ether is only undertaken in very exceptional cases. It is to this careful correction of deformity as soon as it occurs, and to the immediate attention paid to any acutely sensitive condition of the joint, that the writers would attribute this exceptionally small percentage of abscesses.

Leaving for a while that side of the question which relates to the prevention of hip abscess, and coming to the analysis of the seventy cases operated on at the hospital between the years 1884 and 1888 inclusive, only fifty-five of these proved suitable for analysis. The others were rejected because the records were imperfect, or because the information about the patients was scanty; and all of these rejected cases were those of the earlier years (1883 and 1884). The cases for analysis were not selected upon any basis except that of being well recorded, and no cases in the last three years were omitted. In addition to these fifty-five cases we have added eight cases of hip abscess from the House of the Good Samaritan, which were not picked, and which were similar to the Children's Hospital cases in every way.

[1] The child is fixed to a bed frame so that motion is impossible. The child cannot sit up or turn over, and when lifted, is lifted on the frame, as on a *gouttière de Bonnet*, or wire cuirass. Fixation is practically as complete as on a wire cuirass, with the addition that traction in the line of the deformity is possible.

The time of the occurrence of these abscesses in the history of the disease proved to be a matter of some practical interest. In fifty-nine per cent. of all the cases, it occurred within one year of the beginning of the disease. Of the remainder, it occurred in thirteen cases within two years; in nine cases, in three to five years; and once each in seven and nine years. In twenty-six of the cases (forty-one per cent.) the abscesses appeared before the patients came under treatment, while four more appeared within two months after the beginning of treatment: so that forty-four per cent. of the total number of abscesses occurred either before any treatment was begun, or within the next two months. In thirty-seven cases the abscess came on while the patients were under treatment, and it is worth while to analyze these cases very carefully. The abscesses came on under the use of a Taylor traction-splint twenty-two times; with the use of a Thomas splint, four times; with the use of a posterior wire fixation splint (the Cabot frame), six times; and under miscellaneous treatment might be grouped four cases—one bed extension, one Sayre short splint, one plaster bandage, one high shoe and crutches. Analyzing the twenty-two cases where it came on in the course of treatment by a long traction-splint, in nine cases it was stated in the records that the treatment was markedly inefficient on account of the drunkenness or carelessness of the parents. In the remaining thirteen cases, where the abscesses came on under treatment by the Taylor splint, the care of the patient at home was good, and the treatment efficient, so far as the out-patient surgeons could judge, except in three instances, where the splints were discarded at home, and the abscesses followed; so that really in only ten of these twenty-two cases did the abscesses come on under what could be considered efficient treatment by this method. The groups of cases where abscesses occurred with the use of a Thomas or Cabot splint are too small for analysis. In the great majority of all cases, where the abscesses occurred under treatment, they came on in from six to twelve months after the application of the splint.

It has already been stated that the operative treatment has been pursued in all cases, and the question of the risk of the operation is, of course, one of very great interest. The technique of the operation has been perfectly simple. The abscess has been freely incised; drained by counter-openings, if necessary; and the cavity has been

curetted, and thoroughly irrigated with a strong corrosive solution. The wound has either been loosely packed with iodoform gauze, or drained by a tube which has remained in only a short time. Antiseptic dressings have been applied for weeks after operation, and only when the sinuses have been reduced to small openings have open dressings been applied.

In the sixty-three cases there was no case of anything approaching septicæmia. In feeble children the temperature rose slightly on the day after operation, from reaction; but it always fell again, and was never of a character to give anxiety, with the exception of one patient who died of tubercular meningitis within ten days after operation. This is the only case in the sixty-three where death could possibly be attributed to the operative procedure, and in no other case did death occur within three months; and generally in the fatal cases it was only after a lapse of one or two years. As a rule, the operation was followed by a decided improvement in the general condition of the patient and by an improvement in the joint symptoms.

Of these sixty-three cases, sixteen are dead and four are dying, while in seven cases the result is not known. This is a mortality-rate of approximately forty per cent., which is exceedingly high in comparison with the death-rate by suppurative hip disease in general. But a comparison of these cases with such groups as the Alexandria Hospital series is unfair, because the percentage of abscesses to the whole number of cases of hip disease is so widely different in the two groups. Here the abscesses were only twenty-three per cent. of all the cases; in the earlier Alexandria group they formed seventy per cent. of all the cases.

The treatment pursued in this series has eliminated abscess in a large number of cases, and confined its appearance, as a rule, to a small percentage of cases where the disease is of such intrinsic severity that suppuration is inevitable; and necessarily the percentage of death in such cases must be a high one. It would, therefore, be misleading to compare the figures of the death-rate with those of Gibney, Marsh, Billroth, or Cazin.

Of the sixteen fatal cases, four died of tubercular meningitis, two of phthisis, three of amyloid degeneration of the viscera, three of exhaustion and prolonged suppuration, and one each from excision and enteritis many months after operation. Of the four cases that

are classed as dying, three have advanced amyloid degeneration of the viscera, and one is hopelessly exhausted, with but little prospect of relief even by amputation. In seven cases the end result is not known. This gives a mortality of nearly forty per cent., in cases which have been under observation but a few years, a majority of them less than three.

It may, then, be said of the operation for abscesses in hip disease, that it is not attended with the risk of septicæmia which is sometimes attributed to it, and that it does not prevent amyloid degeneration from taking place.

The present condition of the diseased limb is not known in seven of the patients, who may be alive or dead. In the sixteen cases which died, with one exception the sinuses were all open at the time of death. In the forty-three cases where the present condition of the patient is accurately known the abscess wound is closed in twenty, and one or more sinuses are still open in twenty-three. Of the cases where the sinuses are still open, in five a year has passed since the operation, ten are open at the end of two years, seven at the end of three years, and one at the end of four years. In the cases where the sinus is closed, the time of closure is, of course, of much interest. In the twenty cases, ten closed within a year after operation and in six between one and two years. In three of the remaining it closed at the end of two years, and in one case at the end of four years. In only one case did it close within six months of operation, and in this case within a month. Secondary abscesses, very superficial, occurring in the cicatrix of the operation, have occurred in one or two cases. It must, therefore, not be expected that the sinuses will close immediately after operation; and in most cases where the closure is to occur, it takes place within a year or eighteen months of operation.

It is very difficult to sum up a paper which is at best only an imperfect summary of an important series of cases. From the figures that have been presented it seems fair to conclude that the preventive treatment of hip abscesses is an exceedingly important matter, and that by the confinement of the patient to bed when symptoms of deformity or joint tenderness arise under efficient treatment the abscesses may be averted in a large proportion of all the cases. But when this smaller proportion of abscesses has occurred in them, the

mortality per cent. is exceedingly high, and the prognostic outlook very much more serious than in suppurating hip disease in general. Operation does not seem to be attended with the risk of septicæmia, nor does it prevent the occurrence of tubercular meningitis or amyloid degeneration; and finally it may be stated that thorough operation is followed, in a fair proportion of all cases, by the speedy closure of the abscesses, a closure which remains permanent.

DISCUSSION.

Dr. V. P. Gibney, of New York.—I would like to correct a misapprehension that the cases referred to in the paper were all in-patients. I have not looked over the tables recently, but I am inclined to think they were both in- and out-patients. The method that was practised then was to let these abscesses severely alone—not to touch them with anything; they opened themselves and pursued their own course. That was the result I obtained from many of the cases. I do not now recall just what the results did show. At present I make it a rule not to interfere if the abscess is not large and unattended by constitutional disturbance. So long as it is pursuing an apparently benign course, irrespective of the dangers of tubercular infection, I do not interfere.

The statistics given are very instructive, and are exceedingly interesting. From what I have seen of the institutions you have in Boston, it would seem that the children are treated antiseptically and treated well in the Children's Hospital. I have had opportunities of visiting your hospital on one or two occasions, and I have reason to believe that all antiseptic precautions are carried out.

We are told by the figures that have been presented that abscesses when opened antiseptically do not close promptly, and that they do not prevent tubercular meningitis and amyloid degeneration, etc. It seems to me the author has prepared a careful statement of his cases, and my experience is in accord with his, and I believe it is the experience of surgeons in New York City. The plan I sometimes adopt is to open them; I make a free incision, sometimes a counter-opening, clean out the sac well, and pack it with iodoform gauze, then repack and convert the sac into a sinus. I do this as carefully as I know how, and still there are a few that do not close promptly. I have very little constitutional disturbance afterward; scarcely any rise of temperature.

After a certain time, when I have a sinus to deal with, I use a common dressing every other day.

I have been interested in one question which should be freely discussed—and that is, whether it is advisable, if we open an abscess, to go on washing that sinus out day after day, or every other day, aiming to squeeze out all the pus, or whether it is better to let it alone, and simply treat the external opening. I read recently very good testimony in favor of not resorting to the plan as followed in the general hospitals, viz., to aim to evacuate completely the tract of the sinus at every dressing.

This summer in a half-dozen cases which were suppurating at the Convalescent Home in Saratoga, I got an opportunity of testing the method somewhat. I took six or eight cases where we had been washing the sinus out thoroughly with sublimate, and sometimes carbolized water, and they did not seem to get on well. The more pus pressed out the more seemed to form. I took these cases and have simply had a nurse to dress them without this form of procedure, and from eight weeks' experience with them, the tendency is in favor of the latter method. But I am prepared to admit that the atmospheric influences about Saratoga are far superior to those we have in New York City. I am not prepared to state definitely that the results thus obtained in the behavior of the abscess cavity and improved health were due to the non-interference with the sinuses, but I propose to follow up a certain number of cases this winter, and expect to prepare the results and report them at the next meeting of the Association.

I should be very glad to get the opinion of surgeons who are working in this line, especially as to these two methods.

The occurrence of amyloid degeneration seems to be present in many cases of my own as well as in those reported this afternoon.

Dr. De Forest Willard, of Philadelphia.—I am very glad that Dr. Gibney has brought up the question of the thorough evacuation of abscesses and of sinuses, especially as regards this squeezing out the pus, as I think this is a subject of great interest to the profession.

Formerly the practice was to evacuate thoroughly all the contents of abscesses and press out as far as possible all the material present.

Such a course increases the danger of tubercular infection of the system, which is the cause of the rise of temperature and hectic, which are so serious. Fever is due to tubercular infection of the system, and it is largely occasioned by breaking up and fissuring of the wall of the abscess. Some surgeons curette the abscess. In my own practice, when an abscess forms, I let it alone until the patient is prepared to

submit to an operation, or until I have thoroughly decided upon the plan of operation to be performed. I want to guard the system against the infection which nature has endeavored to wall out. Local tuberculosis may become general.

Having decided upon the operation of erasion or excision, I then open the abscess at the time of operation and remove all tuberculous material both of hard and soft parts, including the wall of the abscess. If operative measures are decided inadvisable, my plan is then to strengthen the wall before I open the abscess. I simply draw off the pus with a large aspirator and throw in ten or fifteen grains of iodoform in glycerin and distilled water, permitting it to remain. In two or three weeks from this time I lay the abscess open freely and under antiseptic precautions. I do not allow one particle of pressure on the abscess for fear it may be the means of producing a fissure and subsequent infection. I simply lay it open with a free incision, then gently wash it out carefully with a large amount of sublimate solution, dress it antiseptically, and let it alone as long as I am able—for days or weeks, or until there is some evidence of decomposition. I apply a gentle compress of wool, endeavoring not to break or injure the wall, as I have said.

In sinuses I do not press out the pus. If there is pocketing, I incise and insert drainage tubes to get rid of the pus without pressing the walls of the abscess or sinus.

Dr. A. M. Phelps, of New York.—The mortality from operation upon these abscesses, I believe, was stated to be 40 per cent. In Dr. Gibney's hospital report, a large number of which were untreated, it was 12½ per cent. These figures do not prove that operative procedure is wrong, for the reason that in the series of cases presented by Dr. Gibney from the Forty-second Street Hospital, we find five or six times the number of abscesses in a given number of cases treated; therefore, the mortality would not be as great in a series of cases treated with a percentage of 60 per cent. of abscesses occurring. In the report to-day, where the mortality was 40 per cent., we must remember that the number of abscesses in the whole series of cases treated was only 23 per cent. as against 60 per cent. in the Forty-second Street Hospital.

We should bear in mind what produces these abscesses, and then arrive at some conclusion as regards treatment. A tubercular hip-joint is not a purulent hip-joint; it never becomes so until inoculated with the pyogenic germs. There must always be the inoculation of the pyogenic germs to produce a purulent hip-joint. The disease begins as a primary inflammation, secondarily tubercular, and thirdly purulent;

or possibly purulent and tubercular from the start, due to double inoculation. Abscesses of the hip-joint, like abscesses in any other part of the body, should be dealt with in a similar manner. If an abscess occurs in the axilla we open it and remove the pus, and thoroughly drain it. We scrape out the whole abscess cavity. In abscess of the hip-joint we should, I think, resort to the same method of treatment. Why do not the abscesses of hip-joint disease heal? It is simply because that back of these abscesses there is frequently bone disease that keeps up prolonged suppuration and discharge. A drainage tube inserted to the point of disease, is a far better sewer to carry away the pus to the surface than a multitude of sinuses.

As regards the squeezing out of pus, I will say that if the abscess is properly opened at first, there will be no necessity for doing this. If it is scraped out properly, and dressed antiseptically, it will become obliterated, except the sinus which leads to the bone disease. I do not see that there is anything to be gained by squeezing the abscess cavity. If you squeeze or wash it out harshly, violence is likely to be done to the hip-joint, which is a wrong thing. Any force in a current of water is apt to destroy healthy new tissue, and certainly manipulation would be more likely to do the same thing.

Dr. Reginald H. Sayre, of New York.—I think I understand the paper in saying those cases which are dying of amyloid and degeneration and general tuberculosis, still have discharging sinuses; that these sinuses do not heal. As Dr. Phelps has well said, as long as the focus of disease is left behind the wound will continue to discharge. In those cases where the abscess heals by first intention, all the disease is removed. Where the disease has not been thoroughly removed it cannot heal. There may be perhaps a piece of necrotic bone in the head which requires a sewer to enable nature to discharge the pus, although it is thought best not to remove the diseased bone, as it would involve the removal of too much healthy tissue.

I am in favor of thoroughly opening abscesses when they show signs of growing too rapidly. I think, however, they may be let alone in the commencement, for we know by experience that many of them disappear. If the patient's condition shows degeneration, or if the abscess is rapidly increasing in size, it should be thoroughly evacuated and washed out with boracic acid or iodoform emulsion. In many cases with such treatment the abscess will close. When an abscess has been running for years and years, and the patient is gradually going down hill, before amyloid changes set in, I believe then is the time to perform a radical operation and remove the diseased bone. Of course,

there are cases in which the disease is so extensive that it cannot all be removed, and in these cases the sinuses will continue so long as any diseased tissue remains behind. It seems to me that the cases reported as dying of amyloid disease and general tuberculosis, are an additional argument in favor of more thorough removal of diseased tissue before the general system has become exhausted beyond hope of recovery.

Dr. Lovett.—I fear we have not made clear the class of cases with which we were dealing in our paper. They were, as a rule the worst out-patients we had, and a large proportion of the abscesses appeared before the patients had any treatment at all; moreover, the patients were under the worst possible hygienic condition throughout the disease.

It seems to me that the inference which Dr. Judson draws from our high percentage of deaths in these cases is unfair. The cases of suppurative hip disease analyzed by Dr. Gibney, represented a percentage of 69 of the total number of cases of hip disease; ours represented a percentage of 33. In so small a percentage of abscesses (including manifestly all the severer cases) the death rate must be necessarily high. It needs no justification, for it could not be otherwise.

With regard to the question of excision, referred to by Dr. Sayre, a number of these cases were excised, and my impression is that nearly all the cases affected with amyloid degeneration had been operated upon. I regret to say that we did not analyze our cases in regard to this point.

In trying to hasten the closure of sinuses we have experimented a good deal. We have washed out the abscesses systematically and thoroughly, without much effect. Occasionally by using iodoform urethral bougies we could get the closure of the sinuses hastened, but, as a rule, they have pursued their own course, without much regard to the medication attempted.

The point we desire to bring out is this: by putting the patient to bed, and making traction in the line of deformity, when deformity or sensitiveness arises in acute hip disease, abscesses may be prevented in a large number of cases, and that when abscesses occur under these conditions the percentage of mortality is necessarily high.

ON THE PRINCIPLES OF THE MECHANICAL TREATMENT OF HIP-JOINT DISEASE.

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Hip-joint disease, especially in childhood, may be described as a chronic tubercular lesion of the coxo-femoral articulation, with the major signs and symptoms in the initial stage suggesting a primary osteitis rather than a synovitis. The clinical history and the course of the disease, and the pathological conditions found both after excision of the head of the femur and after death, all tend to emphasize this statement. In discussing the principles which should govern us in the treatment of this lesion I shall accept this as my text, for without some generally understood pathological basis it would be difficult to formulate any definite principles of treatment, either mechanical or otherwise.

Nor can we proceed intelligently without a glance, at least, at some of the more important of the signs and symptoms of the disease. And we will briefly consider some of them.

As is well known, an insidious and generally unexplained limp is almost always the first sign that claims our attention. And this very suggestive evidence of the change that is going on in the articulation is always, I think, accompanied by a still more suggestive and important indication, viz., an instinctive and involuntary muscular protection of the articulation. Long before pain or any apparent deformity appears these two important indices of hip-joint disease are present; and it is now, I think, generally accepted that the condition which accompanies these two signs, when typically expressed, is that of the first apparent stage of hip disease. My own experience has proved, and every year the proof has grown stronger and stronger, that this limp and this instinctive and involuntary muscular joint

protection are necessary to establish a diagnosis of hip disease in the earliest stage. We all recognize that many other conditions may produce a limp and the muscular signs which simulate hip disease, but the differential diagnosis is not on the whole difficult, owing to the peculiar and expressive character of the involuntary muscular protection of the joint.

It is not assuming too much, I am sure, to say that these two signs—the limp and the instinctive muscular protection of the joint—have a peculiar significance. The limp may be interpreted as an instinctive effort on the part of the patient to avoid the increased inter-articular pressure produced by the simplest act of locomotion; and the second, the muscular protection, indicates that the muscles, acting upon the affected articulation, guard the joint when the joint lesion is exposed to even the slight traumatism of passive motion.

The whole expression of the articulation in the first apparent stage of hip-disease is, if I may be allowed the expression, one of joint apprehension under certain tests and in certain conditions. It is very like the apprehension which accompanies the more advanced and painful stage of the disease, when any and every movement of the joint produces an agonizing pain—only the acute pain is absent, and the apprehension is less marked. In short, it is the first stage of a chronic disease, unmarked by pain or fever, and the whole expression of the affected joint under examination is that of a protest against traumatism, both the limp and the acute but slight muscular resistance crying out against the simplest functions of the normal joint—viz., gentle locomotion and a natural degree of articular mobility.

It is well known that this first stage of hip-joint disease—the stage of vulnerability—where the trouble has not fully developed, but where nature has kindly given us ample evidence of the extensive mischief that is impending, the limp referred to as occurring in this first stage may disappear. The rest and protection which the patient instinctively gives the affected joint are sufficient in some cases to remove the limp and to modify the involuntary muscular protection. But the joint still remains vulnerable, and a major traumatism, like a fall or a blow, or even the constant repetition of the minor traumatism caused by locomotion, re-excites the latent pathological condition, and the limp returns and muscular protection again becomes pronounced. I have known this to occur seven times

in one patient before the symptoms became so pronounced that a diagnosis was made, the surgeon in attendance being unfamiliar with the fact that a remission of the limp was likely to occur in the early stage. It has happened several times in my experience that the limp has disappeared without active treatment while the patient was under observation. I have watched these cases with much interest, and I have found that *the muscular protection of the joint did not wholly disappear, as the limp did.* It may be worth while to say that temporizing in these cases proved a mistake, for in every case, after a lapse of weeks or months, and in one case of two years, the symptoms reappeared with redoubled energy, and the lost time was not always wholly regained. In short, so long as there is a true pathological and involuntary muscular protection of a joint in the first stage of tubercular hip-joint disease (and also, I feel sure, in the second and third stages as well), we must imitate nature's method and place the joint under conditions where it can receive no major or even minor traumatism.

And this, it seems to me, must be the fundamental principle of mechanical treatment—viz., to protect the affected joint—and to secure for it that which nature from the very beginning of the lesion attempts to secure—relief from traumatism. In the first apparent stage, that of the initial vulnerability of the joint, where the limp is slight and the muscular protection is only, perhaps, just perceptible, adequate mechanical protection of the affected articulation is just as imperative, in my experience, as it is when the disease is well defined and fully developed. All of the cases that I have watched where rest—simple rest in bed—has been pursued as the only treatment, have failed to obtain permanent relief. I have watched cases of this kind long enough to know that those which I have thought were cured, and if I had been writing an essay at the time they passed from active observation I should have reported as cured, have all, after a longer or shorter time, relapsed, if prompt relief from traumatism was not given by apparatus efficiently applied.

From a mechanical standpoint, therefore, the first object of treatment should be to modify or to remove absolutely, if possible, traumatic contact of the opposing joint surfaces in hip-joint disease; for, however much the medical profession may differ regarding the influence of traumatism as applied to the etiology of this disease, I

think none will deny its baneful influence after the lesion is once established in the joint. The second object, having placed the patient under the best possible local (joint) conditions for repair, is to surround the patient by those hygienic influences and to administer those remedies which will aid nature in eliminating a tubercular disease. On this point I need not dwell. I think this Association as a unit will agree that a patient with tubercular disease in any part of the body will do better, for example, in the pure air of the Adirondacks than in the wards of a hospital. And if the patient has hip-joint disease he will do better walking about in the fresh air in an efficient protective apparatus properly applied than if he be confined to bed with or without a protective splint.

To return to the first object, that of securing a modification of the traumatic contact between the surfaces of a tubercular hip-joint. We have seen how nature instinctively protects the diseased joint in the first stage. In dealing with the more difficult problems of the second stage (that of deformity) it will be well if we again look to nature's methods and see what she attempts to do; and we will be wise if we imitate, if we can not always accurately follow, her example.

The first apparent stage of hip disease has been referred to. This early initial stage is one where, in my experience, it is comparatively easy to secure a perfect cure of the disease without deformity or without any serious modification of joint mobility. If the first stage, however, be permitted to go unchecked, as it usually does in the absence of any urgent symptom, the second stage, that of deformity, appears sooner or later. The signs rather than the symptoms of the stage of vulnerability have passed unheeded, and nature has narrowed day after day, week after week, perhaps even month after month, or year after year, the arc of femoral movement in all directions, until in many cases the results are apparent ankylosis of the articulation with a marked deformity. This deformity is apparent first as a flexion; then, as a rule, follows abduction, and this is usually accompanied by a rotation outward of the femur. After a time adduction and rotation in the opposite direction may ensue, but flexion is always present.

It is not only possible, but in many cases more than probable that a good result may be obtained with free joint motion in the

second or deformity stage. But the golden opportunity has passed when the limping gait becomes emphasized by a deformity, or, in other words, when the muscles, having placed the joint in the position of the least traumatism and of the greatest ease, instinctively and involuntarily protect, to the best of their ability, the diseased part or parts.

In the early part of the disease, and oftentimes in the second stage (before true adhesions have formed), if we administer an anæsthetic and pursue its effects until a profound narcotism is produced, we find there is little or no resistance to full and free joint motion. As soon as we temporarily interrupt the reflex arc, and relieve the muscles of their duty, we find the muscular evidence of hip-joint disease—*i. e.*, there is no resistance to free-joint movement and there is no deformity.

Nature, in short, in hip-joint disease, is producing in her own way an involuntary muscular splinting of the joint—the tense and shortened muscles, in a typical case, making an almost perfect coaptation splint. But there is this difference between the conventional coaptation splint of surgery and the involuntary muscular splint of hip disease: the force of the former is exerted, as in the treatment of a fractured thigh bone, for example, *laterally*, or in a direction which lessens the circumference of the splint. On the other hand, in hip disease the force of the muscular splint is exerted *longitudinally*—*i. e.* in the direction of the long diameter of the contracted muscles, or in that direction which throws the head of the femur against its socket. This muscular splint in hip-joint disease simply avoids the major joint injury of motion and pressure combined by substituting for it another form of articular injury—viz., an inter-articular pressure which limits motion and retains the joint by means of this inter-articular pressure in that position which, unaided by art, inflicts the least injury to the diseased joint. The limitation of motion in the joint is accomplished only at the expense of an intensified joint pressure—a pressure which is much further increased by any form of mechanism which uses the femur as the long arm of a lever to correct the deformity.

When the second stage is reached locomotion becomes very difficult, the whole body swaying around a deformed joint, and each successive traumatism—even that of walking with the aid of crutches,

and surely that of an unscientifically applied apparatus—produces a fresh grazing field for the tubercular bacilli. The transition from the second to the third stage (that of joint disintegration) is so gradual that it is difficult to draw the line. But, sooner or later, if the disease be not arrested, a more or less rapid joint disintegration ensues. The femoral head becomes smaller and smaller, the acetabulum becomes concentrically enlarged, perhaps perforated, abscesses may form, and finally, after the disease has run its course, the ultimate deformity and disability with which we are all familiar appear. Even in this last stage the muscles are tenacious of articular control, and refuse to grant the full movement the altered joint surfaces permit. The muscles are only quiescent when in those exceptional cases, and after years of struggle, actual ankylosis occurs, or the tubercular process is wholly ended.

It seems perfectly apparent to me that the deformity of the second stage is due to an involuntary muscular action, and that the deformity of joint disease, irrespective of the question of whether there is a synovial effusion or pus within the joint capsule, represents nature's position of greatest ease. This muscular coaptation splint is nature's only way of modifying traumatic contact of the opposing joint surfaces, and this modification is secured by a change of position. It would seem that this muscular effort or splinting is more apparent in some cases than in others.

At the clinic of the New York Orthopedic Dispensary and Hospital we see quite often cases of a very considerable and sometimes very tense accumulation of pus and tubercular material within the capsule of the knee- and ankle-joints, where there is little or no interference with articular mobility. The deformity in these cases exists only in joint outline. The mechanical relations of the opposing joint surfaces are not interfered with, and there is little or no muscular effort, either voluntary or involuntary, to control or limit the movements of the affected articulation, and pain is wholly absent. The signs of disease (there are no symptoms present at all) which present in this class of cases at the knee and ankle do not seem to indicate an osteitis; on the contrary, the synovial membrane is distinctly diseased, and the lesion is probably confined to this membrane, and perhaps superficially to the cartilage also.

In this class of cases, where the synovial membrane is apparently

much affected, and the oseous tissues have escaped major injury, nature makes no effort to limit joint motion by muscular action. I have attempted elsewhere to explain why this is so.[1] I merely desire on this occasion to call attention to these two classes of chronic tubercular joint disease—the synovial and osteitic—and to say that where the synovial membrane is primarily and solely affected at the knee and ankle, the mechanical treatment should be different from that which will be mentioned in this paper on tubercular diseases of the hip.[2] And I also wish to call attention to the fact that in hip-joint disease we are always met by the initial symptoms of a bone lesion rather than those of a simple synovial disease. Whether we have chronic synovial disease at the hip in the early stage of the trouble, it is impossible, from a clinical standpoint, to say. In the well-marked cases of uncomplicated synovial disease at the knee and ankle, the only evidence of the lesion, as already remarked, is an objective one—a synovial swelling—a sign that for anatomical reasons is not always available at the hip.

The cases of synovial disease at the knee and ankle are, however, much less frequent than those which at the same articulations from a muscular standpoint are the perfect analogue of the muscular and deformity conditions found in hip disease. In these latter cases there is no essential change in joint outline, no evidence of a distended or swollen capsule or synovial change, but rather a spurious ankylosis induced by the same muscular conditions which produce the second stage of hip-joint disease. Here, in this latter or osteitic class of cases at the knee and ankle, it is easy to interpret nature's effort to modify the traumatic contact of the opposite joint surfaces, and to understand that in the osteitic condition nature abhors motion, and uses every effort to restrain it, and to restrict it within certain limits. Within the limit set by nature, motion I believe to be harmless, and hence it is that it seems wrong to immobilize a knee-joint, for instance, with simple, uncomplicated synovial disease of the tubercular variety. But, if we attempt, in the osteitic form of the disease, to pass beyond the limit by nature, or if we try by unscientific means

[1] The Etiology and Pathology of Chronic Joint Disease. A Series of American Clinical Lectures, vol. iii., No. 6.

[2] A Lecture on the Prognosis and Treatment of Ankle-joint Disease. Annals of Anatomy and Surgery, May, 1882.

to secure a better position for the distal half of the joint when nature by her every expression says "No," we ignore the valuable lesson which she teaches us and inflict more injury, in many cases, upon the diseased articulation than all our boasted orthopedic science can relieve. And a very wide difference of opinion among both orthopedic and general surgeons would be bridged, I think, if the fact were recognized that where there is some or even a little motion at a diseased joint, true immobilization is not necessary. But motion under these circumstances should be controlled within the limit set by nature. A joint that is practically immobilized by the muscular coaptation splint will recover motion under the absolute fixation of traction, as has been proved very many times.

I have seen on many occasions, especially in the large general hospitals of this and other countries, irreparable injury inflicted upon a slightly diseased hip-joint by useless manipulations and tests, both with and without anæsthesia. I have known apparently curable cases to be rendered hopelessly incurable by an ill-advised attempt to rectify the deformity of hip disease in the second stage, when there was little or no thought bestowed upon the plain expressions, muscular and otherwise, of the pathological condition. The absence of pain is too often made the criterion of whether a patient with hip disease should be subjected to certain tests and certain forcible methods of treatment, the decision generally being that if there is no oral expression of pain the joint would stand almost any desired force without injury. My own experience leads me to say that very frequently the patient in whom there is an entire absence of the oral expression of pain is the one who should be the most carefully and conservatively treated, and about whom should be thrown the most careful safeguards against traumatism. No one, for example, would be likely to advise the use of forcible measures to remove deformity in a case of hip disease when the patient was in the exquisitely sensitive stage; and yet many patients, where this acutely sensitive stage is but a step removed, are subjected to unnecessary and, in many cases, to unscientific measures of treatment. My experience leads me to say that if there is a condition where preventive measures can be applied, where much mischief can be prevented, where it is our duty to anticipate the next bad phase of the disease and to avoid it, it is in hip-joint disease and allied affections; and he who passes by

unheeded the plain indications, or he who with a limited experience maintains that operative surgery can accomplish in the treatment of chronic joint disease more than nature, conservatively assisted and protected, has as yet to learn the pleasure that can be derived from a patient and diligent conservative treatment of a diseased joint.

If, then, we are to aid and imitate nature, rather than to force her, in the treatment of hip-joint disease, and we have interpreted aright the various phases of this condition, there need be no hesitation as to the course to be pursued.

In the first stage—that of the earliest noticeable vulnerability of the disease—when there is a slight limp and an almost normal arc of motion, it is comparatively easy to protect the articulation from traumatism, because nature affords a wide range of movement within which, with scientific mechanical protection, it would be difficult to apply any traumatism to the joint. There is no articular deformity present, and the muscles are not tense and irritable, except as the vulnerable parts are exposed to contact or pressure. While it would seem that the mechanical treatment of these cases is simple, it is best to take no risk, but to make the artificial joint protection as complete as possible. The major difference in the detail of treatment between the first and second stage is that while in the second stage we must overcome or greatly modify the deformity before permitting locomotion—and a shorter or longer period of recumbency is necessary to accomplish this—in the first stage we have no deformity, and the patient can at once assume the upright position, and walk about in a properly constructed apparatus. When the deformity of the second stage is removed, locomotion—also with the aid of proper apparatus—is to be advised, and within certain limits encouraged.

It is, therefore, the second stage of hip-joint disease that demands our principal attention, for in this stage we are met by the most expressive evidence of the disease, and the most important problems of treatment, and it is in this stage that a single error may undo the work of previous weeks or months.

Let us, for example, take a case of hip-joint disease in the second stage, where there is a marked deformity, and where there is a very considerable modification of articular mobility, and attempt to determine the indications for the mechanical protection of the joint. We

need not stop to consider whether pain or abscess is present. The indications from a mechanical standpoint are the same, whether these conditions are present or absent.

The principal apparent expression of the joint lesion is the deformity. It is so important, both to the mind of the patient and his friends, and, in many instances, to the surgeon himself, that the grave lesion of which it is the simple index is lost sight of, and the mistake is very frequently made of hastening the reduction of the deformity at the expense of the articular disease itself. It is here that errors are most frequently made, and it is here that we should be prepared to use, with all patience and diligence, the most scientific and efficient means at our disposal. I have often remarked that if hip-joint disease was unaccompanied by its expressive deformity it would lose its principal terrors for both the surgeon and the patient; and he who would strive for the best attainable result in this formidable complaint must always remember that hip-joint disease is no trifling affair, and that it were better—far better—to use no mechanical treatment at all than to attack the disease by an immature and unscientific effort, by apparatus or otherwise, simply to modify one of its signs. I have no doubt at all that much irreparable mischief, and that many avoidable abscesses, and death itself, have been occasioned by meddlesome mechanics in the treatment of hip-joint disease, and I know of no problem in orthopedic surgery, unless it be that involved in the mechanical treatment of true lateral curvature of the spine, which requires the expenditure of more thought and effort than that which claims our attention in the treatment of hip-joint disease in the second stage.

Whatever may be the primary cause of the deformity in the second stage, no one, I think, doubts the important part assumed by the muscles in the production of the malposition, as well as in maintaining it after it has once been produced. And no one who has examined many cases of hip-joint disease in the deformity stage can doubt that the principal resistance to the reduction of the deformity lies in the muscles, which are on guard all the time to protect the joint from undue movement, which, in joint language, is synonymous with the slightest traumatism. The first and the most important step in the treatment of the disease is to remove this element of trauma from the joint. This simple statement underlies the whole

problem of the value and of the necessity of mechanical treatment, and I have no hesitation in predicting that that method which best subserves this indication is the one which will outlive the others.

If in the second stage the thigh is flexed and abducted, and we attempt by manual effort to overcome either deformity, even if guided by the intelligent hand of the most experienced orthopedic surgeon, we find that the muscular resistance can not be overcome by any ordinary effort, and that nothing but an extreme degree of force, which inflicts intense pain, will modify the acquired position of the femur, and bring it into the so-called straight position. There can be no disputing that this resistance to the reduction of the deformity, and the pain that we inflict while doing so forcibly, mean that the joint, in its sensitive and apprehensive condition, demands adequate protection; and they mean as well, also, that he who would afford his patient the most complete relief and the best attainable result will study these and other things which the joint almost talks to us about, and make available the lessons which they convey.

It seems perfectly apparent to me that a joint in the condition above described needs, as a first step toward recovery, an essential modification of the traumatic contact between the opposing articular surfaces[1]—not in the position we wish it to be in, but in the position which nature has selected.

No one who has seen a child suffering with the agonizing pains of hip-joint disease, who has been crying night after night with the lancinating neuralgia of an inflamed hip-joint, go to sleep soon after the thigh has been held quietly but firmly in the chosen position of the disease, can doubt the value of the relief afforded by manual support and protection intelligently applied to these cases. The certainty of the relief afforded by this simple test is in no way diminished by suddenly, or even gently, relaxing the support given by the hands of the operator. The quick and apprehensive cry that follows, and the shiver that runs through the frame of the little sufferer, give positive evidence of the value of properly applied protection in these conditions. It is, I think, our uniform experience that

[1] Dr. E. G. Brackett, of Boston, has proved that in childhood distraction of the hip-joint is an evident fact. *Vide* Boston Medical and Surgical Journal, vol. cxxi., No. 17, October 24, 1889.

when pain is present in these cases it affords an infallible guide and an unerring indication as to treatment. My own experience goes still further, and I am prepared to say that if pain were present uniformly in the second (or even the first) stage of hip-joint disease, our results would be better and sooner attained. My experience further demonstrates that those who aim for the best attainable results are those who treat their patients as if there were a slight pain present all the time, and who follow them up with the same careful attention they would bestow upon a joint that is slightly sensitive; for the less sensitive joints are none the less removed from the dangers that threaten the painful ones, and the feeling of false security that comes to both the patient and the surgeon, when pain is not present, leads to many errors of treatment and to many bad results. In a well-applied portative apparatus, embodying correct principles, the patient is apt to forget that he has any joint disease, and the surgeon is prone to hope, if not think, after a while, that the worst is over, and that a favorable end of the disease is very near. It is under these circumstances when the symptoms are latent only, and when the disease, though either stationary or progressing toward recovery, is far from the desired end, that it is the duty of the surgeon to relax in no way his attention, for the period of convalescence in hip-joint disease is in many respects the most perilous.

I think I am wholly warranted in saying that, whether pain is present or absent, we should adopt from a mechanical standpoint the best-known means of modifying, as a first and as the most important of all considerations, the traumatic contact of the affected joint surfaces.

In the experiment referred to above, when manual support is given to a painful joint, it is found that simply supporting or fixing it by the hand or hands gives little or no relief. If the lever principle is added, and it is attempted to fix the joint in that way, the pain is increased. But as soon as a traction force is applied—the body forming a counter-traction—relief is almost instantaneous. And it is found, in typical cases, that the pain returns just as soon as the traction is relaxed or modified. This experiment has been made by us all, and in many cases and under all kinds of circumstances, and it is among the well-demonstrated facts of orthopedic surgery. If, now, continuing our tests, we attempt to alter the relation of the joint

surfaces to each other—*i. e.*, attempt to correct the deformity even while exerting this traction or pulling force—we find that the pelvis moves with the femur, so strong, so active, and so incessant is the muscular splinting of the joint. We also find that when the change of position involving the use of a lever is attempted the pain at once returns, and the more force used in making traction, save in the position which gives the patient comfort, the more the patient complains, and the greater is the pain inflicted.

Let us pursue our experiments with manual traction still further. Let us keep up the traction for an hour or two, or even longer, in the direction which brings relief, as I have done on many occasions when, with no apparatus attainable, sleep could be purchased by manual traction. What happens? Little by little, as the trauma, which has been exerted upon the hip-joint surfaces for the preceding weeks or months, is relieved, the muscles relax their tension, and it becomes possible to obtain an increase in the joint motion without inflicting pain. After traction has been kept up persistently and intelligently for an hour or two under these circumstances, the patient will even sleep for a short time without any traction at all But, if we desist entirely, and allow the limb to resume its chosen position again, the muscular tension soon returns, and the joint will become as rigid and as painful as before, under the influence of the muscular splinting, which is so characteristic of both the painful and non-painful conditions.

These experiments have, doubtless, been unconsciously made by us all, not only with the hand, but by properly constructed and applied traction apparatus. It is an almost daily experience for us all to reproduce with traction apparatus the effects of manual traction, and when traction apparatus is properly applied, the joint, supported and protected in nature's indicated position, and relieved from the constant traumatism of its own effort, begins to mend. The muscles, relieved of their duty of splinting the joint, relax their grasp. The deformity soon becomes modified, and after a few days or a few weeks the deformity is removed, or sufficiently modified, so that the patient can walk about in the open air, and gain that great advantage which properly applied portative traction apparatus gives—viz., gentle exercise and locomotion in the open air, with a minimum of restraint as applied to the general functions of the body.

We may now formulate some of the conclusions applicable to the conditions found in hip disease, and its mechanical treatment.

1. The initial signs of the first stage of hip-joint disease are, as a rule, a limp and an involuntary muscular protection of the articulation.

2. The involuntary muscular protection frequently, if not always, precedes the limp. It also precedes the pain, which is generally a very late symptom, occurring almost always in the second stage.

3. The more insidious the approach of the disease, the greater, as a rule, is the necessity for ample protection and prolonged observation. This is particularly true of an insidious and inveterate muscular protection of long duration, which scarcely varies from month to month, and, while limiting the joint motions only slightly in all directions, is unaccompanied by any evidence of pain, except as the femur is used as a lever to overcome the muscular resistance.

4. The first indication from a standpoint of mechanical treatment is to remove as far as possible all traumatic influences from the diseased articulation.

5. This can best be accomplished by some form of apparatus which possesses the power to modify directly, or to remove wholly, interarticular pressure.

6. Our efforts to relieve the pain of the acute stage are abortive until a traction force is used.

7. The deformity of hip-joint disease is due to an instinctive and involuntary muscular splinting of the articulation, which muscular protection becomes modified after efficient traction is applied.

8. The presence of the muscular splinting of disease necessarily indciates the existence of a greater or a less degree of interarticular pressure in those positions where muscular contraction resists the reduction of the deformity.

9. This muscular splinting exists very often to a very great degree without any pain at all, and in these cases, as well as in those where pain is present, traction is necessary to protect adequately the diseased articulation.

10. The muscular signs of hip disease, especially the instinctive and involuntary muscular protection, are by far the most important,

both as applied to diagnosis and prognosis in hip disease, taking precedence over pain.

11. Clinical experience proves that all the important signs and symptoms of hip disease are at once modified by intelligently and scientifically applied traction, the modification of the symptoms and signs being in almost direct ratio to the efficiency of the protection thus afforded the affected articulation.

12. Where there is no deformity present a portative traction apparatus may be applied, and the patient may at once assume the erect position (ample protection being afforded the diseased joint), and walk about in the open air almost without restraint.

13. If the disease permits a certain amount of motion at the affected articulation, motion within the limit set by nature is not harmful. It is only the cases that nature attempts to immobilize by an emphasized muscular splinting that require artificial immobilization, and these latter cases acquire motion under the immobilization produced by traction applied with this end in view.

14. Where deformity is present the patient should be placed in the recumbent position, with the affected member at rest upon an inclined plane in a proper traction apparatus. Both the traction apparatus and the inclined plane should be so constructed that any desired position may be obtained without disturbing the patient or the affected joint.

15. The deformity assumed by the involuntary muscular action indicates approximately the position in which we should make our initial mechanical traction.

16. Clinical experience proves that to make traction "in the line of the deformity" is an error. We should rather say that traction is to be made *in the line of comfort*, and this means that the angle of traction should be less than that of the deformity—*i. e.*, the joint should be placed in a position of greater flexion than that which is the exponent of the disease. By doing this we make traction wholly in a direction which modifies interarticular pressure, and we avoid the error of the lever apparatus, which makes a fulcrum of the diseased articulation to overcome the deformity.

17. The time necessary to overcome the deformity should always be given with the patient recumbent, as above described, and the line or angle of traction should be changed, not arbitrarily from day

to day, but as the relaxation of the muscular splinting allows a change of position without any injury to the joint.

18. As soon as the deformity is reduced, or sufficiently modified, the traction apparatus arranged for locomotion should be applied, and the patient should be allowed to have the benefit of gentle exercise in the open air, without interfering by crutches or other unnecessary apparatus with the normal functions of the rest of the body and the unaffected members.

19. Traction during recumbency with an apparatus that has a strong pelvic band and double perineal pads is superior to the weight-and-pulley traction, inasmuch as the former gives us complete control over the pelvis as a point of counter-traction.

20. If the joint is very painful and sensitive—even if there be no deformity—the joint should be given the extra rest which recumbency, traction, and a relaxed ilio-psoas muscle bring. The presence of a cold abscess is not a contra-indication for locomotion in a proper portative traction apparatus, nor are several sinuses a bar to outdoor treatment with a proper protection splint. The only contra-indications to locomotion and outdoor life are a very sensitive joint, an acute phase of the abscess, and the existence of a considerable deformity.

21. Any apparatus embodying the lever principle alone—that form or those forms of apparatus which make the femur the long arm of a lever to "pry" the joint straight—are, I believe, very strongly contra-indicated, except in those cases where the articular adhesions prevent the reduction of the deformity by traction. Luckily, these cases are rare. When met with, however, I believe that it is better to reduce the deformity at once under ether, and then to apply efficient traction, rather than to subject the diseased joint to the prolonged and irritating traumatism of a powerful and constant leverage.

After reviewing the whole field, it seems to me that we can not avoid the conclusion that we should use traction as a means of relieving the self-imposed muscular traumatism of the joint, not only to meet the very evident general mechanical conditions, but to relieve the muscles as well. The muscles were long ago tired out before the painful stage appears, and we should appreciate the constant strain the muscular tension imposes upon the central nervous system. It

has been taught that we should make traction to "antagonize the muscular spasm." I think this is an error. It seems rather that we should rest the joint by giving it immunity from the traumatism of inter-articular pressure, and then await the gradual yielding of the muscles. This will soon permit us to place the distal part of the joint in the desired position, and we need not inflict the slightest injury to the joint if we proceed carefully. I am sure that this object can be secured by the intelligent use of traction and counter-traction.

And the mechanism of this traction apparatus should be so arranged that it can be adjusted to any desired position without removing it from the patient. We can then cause the apparatus to follow the thigh as it falls into position, and not force the thigh to follow the apparatus, as we must always do if we use the lever apparatus without the traction attachment.

The objections to any form of apparatus which embodies the principles of the lever alone are very great. It seems to me that this principle as applied to the treatment of tubercular joint disease in the light of the pathology of the disease, in the light of the muscular conditions which accompany it, and the unerring certainty with which the lever aggravates the already existing traumatism, is crude and unscientific.

Those who favor and use the lever apparatus always insist upon the necessity of removing the superincumbent weight of the body from the diseased joint. They forget or ignore the fact that the underlying articular pressure produced by the muscular splinting of the joint is just as injurious, if not more so, than the superincumbent weight. It is easy enough to remove the superincumbent weight with crutches (but this alone will not cure the disease), and it is also easy to gain position by making the femur the long arm of a lever. The muscles must yield if the lever force is sufficient, but the joint already disabled will suffer. It will be interesting in the future to see the results produced by this lever plan of treatment.[1]

[1] In An Analysis of Twenty-one Cases of Hip Disease treated by the Thomas Splint, by Mr. John H. Huddleston (Boston Medical and Surgical Journal, Oct. 24, 1889), it was found (the Thomas splint being a typical "lever-fixation" splint) that the general results were as follows: "Good position with little flexion and adduction, but great shortening, great atrophy, and very constant elevation of the trochanter above Nélaton's line with a remarkable percentage of abscesses."

But if, on the other hand, we can successfully give the affected joint not a fictitious "rest," not a pseudo-"immobilization," not a fallacious "fixation," but by supplementing the artificial joint protection, be it what it may, with an additional apparatus or attachment which will imitate the action of manual traction, we shall accomplish the end that nature seeks by her ceaseless and involuntary muscular protection in an osteitic joint disease. We must do more than "rest," "immobilization," or "fixation," as described by some writers who use these terms, can produce, because all these "methods" have for their aim, not so much the avoidance of traumatic contact between the opposing joint surfaces as the maintenance of a traumatic contact which already exists and which must necessarily be emphasized by the application of the lever principle or of any of the so-called "fixation" splints. As long as the muscles guarding a diseased hip-joint are in a state of ceaseless contraction, as long as they are actively and instinctively engaged in securing for the diseased articulation the best protection they can give, our mechanism for the relief of the joint should embody some means of successfully combating the effects of their incessant action. And we should always be prepared to produce true physiological rest for the over-tired muscles and the vulnerable articulation; we should be able to secure real immobilization of the joint when it is indicated, and we should always be ready to give the joint absolute fixation when it seems necessary, just as we should permit, and even encourage, motion when the joint condition does not contra-indicate it.

And, as I look over the entire armament of orthopedy, I know of no mechanical method of accomplishing all that we desire in these difficult and tedious cases of hip-joint disease except that which imitates the simplest method of relieving the inflamed joint—viz., manual traction.

And I feel that if this principle of traction be scientifically utilized, and adapted to the needs of each individual case, there is no doubt that we shall give to our patients suffering from hip-joint disease and allied articular affections the most perfect mechanical protection available, which is, after all, the *sine qua non* in the treatment of chronic joint disease.

THE RATIONAL TREATMENT OF HIP-JOINT DISEASE.

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There is little to encourage the practice of routine in the surgical treatment of hip-joint inflammations. Nothing can take the place of a critical analysis of the patient's general state, the condition of the joint and neighboring structures, and the nature, grade, and stage of the inflammation, upon which to base our management. What is required at one time is harmful at another, and no one apparatus or device will meet the various indications in the progress of the disorder.

In the acute, progressive, and destructive stage the irritation of the inflamed tissues, aggravated by repeated and unavoidable violence, is reflected to the neighboring muscle groups, which are thrown into spasmodic action; motion at the joint is automatically and instinctively restricted, but with a detrimental increase of pressure on the joint surfaces. We have an analogous condition in the fissure of the anus, where the local irritation causes spasm of the sphincter, and spasm of the sphincter keeps the ulcer from healing. As in this condition stretching the sphincter abolishes harmful pressure, so in the irritative stage of hip-disease physiological rest for the joint, with protection from injury, are required.

There has been a good deal of discussion as to whether motion or pressure is the more harmful factor in joint inflammation. Probably, either is injurious in the acute stage, and both combined still more so, but it seems to be *practically* more important to relieve pressure than to abolish motion entirely. The instant relief from distress which follows so often on counter-extension[1], without positive

[1] Traction alone, as by a weight, does not produce the same result.

fixation, the speedy improvement in the local and general condition of the patient, and the favorable course of the disease under the same treatment, are very suggestive. Counter-traction, no doubt, lessens motion, but it does not accomplish positive fixation even when recumbency is added, for the limb undergoes progressive changes in position. Many years of practical testing have shown that whatever motion may be permitted by counter-traction (combined, when necessary, with recumbency for short periods), does not interfere with the favorable progress of the case, while the undesirable restriction of long periods of recumbency or of confinement to fixative apparatus is avoided.

Treatment by protective traction, however, can hardly be said to be on trial, as it has been in use for thirty years, and has made hip-disease one of the most curable of the graver surgical affections. Though the plan pursued by Dr. Taylor was put on record in its essential principles in 1867,[1] and experience since then has but served to emphasize its utility, it may not be without interest to sketch the main features of the method as now employed.

Briefly, in the acute stage the patient is put to bed, and counter-traction made by means of the long splint reaching under the foot. The five-tailed adhesive plasters are so applied that the knee is protected from damage, and the leg rests in a sling, which is elevated until the small of the back touches the bed, and traction is in the line of the deformity. Lastly, six to twenty pounds extra weight is attached to the apparatus, which is positive in its action, and protects the joint from shock or undue pressure under all ordinary circumstances. The patient is kept continuously in bed until the hip muscles are well relaxed, and the deformity due to spasm overcome. Usually, from three to six weeks are sufficient in a tolerably advanced case. He is then allowed to get up with the splint applied, either walking on the perineal strap of the apparatus or using crutches and allowing the leg to hang.

Traction by the apparatus is kept up continuously day and night; and the weight is still worn at night. The splint is never removed except to change the plaster, when traction must be maintained by a

[1] Some Considerations in Regard to the Treatment of Hip-joint Disease; The Medical Record, Sept. 1, 1867; and more fully in On the Mechanical Treatment of Disease of the Hip-joint. Wm. Wood, New York, 1873.

weight fastened to the ankle, or by the hand. Frequent manipulation of the joint should be avoided, and riding should be forbidden on account of the jarring, which is most harmful. The patient thus goes about on his traction splint quite comfortably, and able to take the fresh air, until irritation in the joint is allayed, which usually takes several months or a year. When all active inflammation has subsided, and the healing process is progressing favorably, the hygiene of the joint requires moderate protected use within defined limits. We then use the supporting splint, or Dow's, with free joint at the knee and ankle, transmitting the patient's weight from the perineal strap to a steel-piece in the shoe, through the apparatus, which is longer than the leg. There is about three-quarters of an inch space between the heel of the foot and the sole of the shoe, so that free locomotion, with little or no pressure on the joint, is possible. There is no doubt that the protected use of the muscles and joint, once the inflammation has subsided, benefits the local nutrition and circulation, and accelerates the reparative process, as is often shown by the drying up of old sinuses and increase of motion at the joint and of strength in the limb.

This treatment must be kept up until the reparative process is completed, the tissues consolidated, the function of the limb restored so far as may be, and the joint prepared for the strain of unrestricted use. As the patient is perfectly comfortable, and has good use of the limb, he is independent of time, and can ill afford to compromise nature's reparative efforts by submitting the recently diseased joint to premature use. It is this careful after-treatment of the joint, during which the patient frequently goes to school, or attends to his ordinary duties, that prolongs the treatment in many cases. If these patients are too soon permitted to walk about without protection to the joint, there is danger of relapses, recurrence of deformity, and diminution of motion and of usefulness of the limb.

Deformities, of which the worst are adduction and flexion, yield, when due to muscular spasm, to counter-traction applied as described. When caused by structural shortening, or held by adhesions, special management, such as I have elsewhere indicated,[1] may be required. It is important to know that the adduction should be first overcome,

[1] The Prevention and Treatment of Crural Adduction. The Medical News, March 23, 1889.

with the leg raised in a sling to the full extent of the flexion present, and the back, shoulders, and head of the patient low. After adduction is overcome flexion will be found to be already lessened.

"Our course has been the reverse of the steps taken in the gradual production of the deformity, from the first slight adduction and apparent elongation of the leg in the first stages of the disease, to the extreme flexion and adduction in the later stage. We have overcome the muscular action by exerting the extending force upon those most contracted, one after another, taking the steps backward to the beginning. During the different steps of the progressive reduction of the deformity above mentioned, we should not forget that our course has been taken because it is the proper course and most effectual for relaxing the muscles for the sake of relieving pressure in the joint. The gradual reduction of the distortion should be regarded as an evidence that we are successful in obtaining this muscular relaxation as a means of treatment rather than the end. During every step, and at all times, the prime object of relieving and protecting the joint should never be lost sight of."[1]

Under the plan of treatment thus sketched the patient is usually relieved of pain at once, and I know of no therapeutic result more striking than the instantaneous relief from pain and reflex distress of properly applied counter-extension in joint disease, a result more convincing than volumes of argument, but dependent, it must be said, on perfect comprehension of the principles involved and absolute precision in their application. "Intrinsic excellence is of no avail without proper adaptation."[2]

Under rational treatment the external pointing and discharge of an abscess is, ordinarily, of absolutely no moment, and does not in the least degree modify the prognosis; abscesses are fewer, and heal sooner, and the final recovery is as perfect when abscesses have appeared as when they have not. Fresh abscesses are treated by free incision, thorough evacuation and closure; some heal at once. Old sinuses should be kept clean, and occasionally injected with the saturated solution of iodoform in ether, always bearing in mind that the proper hygiene of the joint and peri-articular structures is the

[1] On the Mechanical Treatment of Disease of the Hip-joint, p. 48.

[2] The Mechanical Treatment of Angular Curvature. N. Y. State Med. Soc., 1863. Dr. C. Fayette Taylor.

vital point in the treatment of both abscesses and sinuses. The success of our surgical procedures is absolutely conditioned by the efficiency of our management of the primary disease.

If the distress of destructive action, aggravated by repeated or continued traumatism of the inflamed tissues, is relieved by efficient counter-extension, the general health improves at once, whether constitutional treatment is adopted or not, and the effect is still more marked when protected locomotion enables the patient to enjoy fresh air and a moderate degree of exercise. Special diathetic vices will be benefited by appropriate medication.

It is thus apparent that it is beside the point to speak of an apparatus for hip disease. The mechanical means employed necessarily vary with the grade, duration, and stage of the inflammation, the amount and nature of deformity, and the position of sinuses and other factors. Embodying the principle of rest with protection in the acute stage, and of protection with movement and exercise in the stage of repair, we must modify our apparatus to meet the necessities of the individual case throughout the changing conditions of its progress.

"In the mechanical treatment of disease of the hip-joint nothing should be taken for granted. No favorable termination ought to be expected which is not the result of clearly defined principles faithfully carried out in practice. Above all, there should be no neglect of those constant watchings which are necessary to appreciate the indications as they arise, and the making of those progressive modifications, in obedience thereto, which constitute *treatment* in the best sense of the word. Patience, painstaking, and perseverance must all be combined, and nothing can be left to chance. The treatment contemplates relief from pressure in the joint *till the end.* A comparatively slight pressure in a sensitive joint may have all the damaging effect that a severe blow would have in a healthy subject, and such an injury may be inflicted any hour during which the proper adjustment of the instrument is neglected. Great pains should be taken to instruct the patient's friends in their duties, and when that is done, as little reliance should be placed on their assistance as possible. Frequent examination of the patient is indispensable."[1]

[1] Op. cit., p. 51.

Here, as in every branch of orthopedic practice, the best conceived apparatus is of no avail unless manipulated to produce certain definite results. It is the painstaking analysis of each individual case, and solicitous attention to details of treatment which are required rather than the application of this or that brace, and the object of treatment is to place the joint under conditions favorable to the subsidence of the inflammation, and to restore as far as possible the function of the limb.

Crutches and high shoe, attempted positive fixation, and recumbency for long periods, with or without the weight and pulley, seem to me alike theoretically deficient and practically disappointing, as comprehensive methods of treatment, though not without value in an emergency, and the eclectic plan of changing from one method to another and following nothing up thoroughly, is worse than useless. Excision is the confession of therapeutic failure.

The treatment recommended is positive, and not expectant, and its keynote is continuous mechanical protection with locomotion, the kind of protection varying with the stage of the disease. It is advantageous to combine a short period of recumbency with mechanical protection in the beginning, and this should be repeated later if there is an exacerbation of inflammatory action; but long periods of recumbency do not protect the joint from damaging spasm, and are often distinctly harmful to the patient. There are many details of which the surgeon must be master at every stage, but with the necessary care and skill, and efficient home coöperation, the plan above outlined has proved its efficiency.

THE EARLY TREATMENT OF HIP DISEASE.

By A. J. STEELE, M.D.,
ST. LOUIS.

The earlier correct treatment is commenced in hip disease, just so much the better will be the results. The reason we have fewer deaths to-day from this affection than formerly, and less deformity, and better average results, is because the cases are recognized at an earlier stage, and sooner subjected to treatment, and, additionally, because of our improved therapeutics.

Not long since, so convinced was I of the importance of early treatment, and also that the generality of physicians, certainly in my section of the country, failed to recognize the disease until well advanced, that I took pains, at a meeting of our State society, to emphasize the diagnostic points and rational signs of *morbus coxarius* in its incipiency. There is too much of the "pooh-pooh," and "growing pains," on the part of the family doctor when the mother calls his attention to the child's limp. As one of our fellow-members remarked at a former meeting, "One reason why we, as orthopedists, so often fail to get these cases in the curative stage is, because of the singular disinclination of the family practitioner to be willing to recognize their seriousness at the outset." We, members of the American Orthopedic Association, making special study of this subject, cannot too often or too emphatically instruct the profession and the people regarding the serious import of lameness and pain in the child.

Could we secure these cases early, the remark of Dr. Gibson, made in 1850, that "upon the whole there are few more diversified or *intractable* complaints than coxalgia," would not apply to-day. In the same connection he makes an additional remark, to which there is a grain of truth applicable in this place: "It is vexatious, there-

fore, to find how often the disease comes under the temporizing treatment of the mere *physician*, who, after exhausting his skill, turns the case over to the surgeon, by whom, if managed *ab initio*, a cure would often be effected in a few weeks."

Some of our members give a gloomy outlook as to results, whether the cases are seen early or late. I am not in accord with such a dark picture. Tables of results, by the best treatment, are yet to be written, and will be an improvement on any yet given.

Our ideas of the correct treatment of this affection turn upon what we believe to be the pathological process going on within or near the joint. Is this inflammatory? Then, that rest is indicated no one will deny—indicated here as it would be elsewhere in any other organ or tissue of the body. Certainly so, if, as sometimes happens, the disease commences in the synovial membrane. Or, is there a tubercular focus near the articulation? Then is it still not rational to quiet the joint, and thus diminish the active circulation in the parts—lessen the pabulum of supply feeding the process?

Experience has shown that tuberculous surgical diseases, when detected early, and judiciously treated by correct constitutional means, and by local rest, do not develop, certainly with but few exceptions, into formidable affections. Such has been my experience with hip disease, local rest having been the sheet-anchor of cure.

In our early days we had a pathological law, *ubi irritatio ibi fluxus*, which in this instance might truthfully be reversed to *ubi fluxus ibi irritatio*, reference being had to a blood flow. Rest to the part diminishes the irritation; thus less blood, upon which the inflammation feeds, circulates in the tissues. Quiet of the part diminishes, too, the nervous irritation, with its attendant reflex phenomena—one of the aggravating symptoms of the affection.

If the engineer finds the steam pressure in the boiler becoming dangerously high he slows down the fire, gives it less fuel. So, while we cannot entirely arrest the blood supply to the joint, we may diminish it by preventing what would certainly increase it, namely, motion. It were well if we could treat a bone tubercle as we would a city fire, put it out; but, unfortunately, in hip disease we cannot safely and certainly reach with our knife and spoon the focus of diseased action. Such operation has been proposed and attempted, but

not yet successfully introduced; however, the future may see it a recognized surgical procedure. I hope so. Until then we must, so to speak, choke it down, starve it out, remove all excuse for irritative action.

This same pathological process occurring in the spinal column is arrested, if detected early and the parts kept at perfect rest. Why should the hip-joint be exceptional? It need not be if therapeutic appliances adapted to its indications can be found. I believe we have at hand the needed means to furnish the necessary local rest to a diseased hip, and yet allow of all the required general hygienic treatment necessary.

The problem of applying the correct treatment to the other joints of the body, when diseased, is comparatively simple, but with the hip it is difficult. As the femur articulates with the trunk, so not only must the limb but the body itself be included in the splint, if immobilization would be secured. My experience teaches that no portable splint yet devised absolutely meets this indication. If the patient is allowed to be up and about, the active child will impart some motion to the joint. But with the body and limb lying, resting, supported, all the muscles at ease, then it is possible to keep the joint at rest. Your thoughts revert to Gurdon Buck's method of recumbency, and extension by weight and pulley, and to Mr. Marsh's enthusiastic advocacy of the same. To a degree I am in accord with the latter, but his method falls short of meeting fully the indications, for first, the confinement is unnecessarily and injudiciously close, his patient being strapped to the couch or bedstead; second, the body and limbs are not so immovably held but what motion occurs at the joint, as, for example, during the use of the bed-pan. To meet these objections I have found nothing more serviceable than the small iron frame, covered with canvas, combining splint and bed. My first suggestion of this apparatus was derived from the *Boston Medical and Surgical Journal*, six years ago. I had never seen the frame in operation, or been otherwise instructed in its use, so depended largely on my own ingenuity to adapt it to the indications of an ideal hip splint.

I learned yesterday from the excellent paper of Doctors Lovett and Goldthwait that the original idea of a frame splint is still in practical operation at the Children's Hospital in this city (Boston),

so that my exhibiting this appliance here at the present time is like the proverbial "Coals to Newcastle." Still, our local brethren may consider it commendable that their thought was appreciated and adopted by others.

I have designated the apparatus the *stretcher splint*, as it combines the idea of a light portable bed with that of a firm, efficient hip splint. It consists of an oblong frame, made of bar iron, one-fourth by one inch, for small children, one-fourth by one and one-fourth inches for older children. Steel can be substituted for iron if a lighter splint is desired, though more expensive. I observe at the Children's Hospital here in Boston that the frames are made of galvanized gas-pipe. I suggested to Dr. Watson at the time his article above referred to appeared in the *Boston Medical and Surgical Journal*, that gas-pipe could economically and efficiently be used for this purpose. He, however, very correctly replied that, so made, the splint could not "be lain upon with comfort;" and, as will be seen presently, the round sides would not so readily admit of attachments being made for the accessory pieces. The comparative expense between the bar iron and gas-pipe cuts but little figure, not varying a trifle either way.

The bar is cut obliquely into four pieces, and the ends welded, or cut square and riveted, the ends overlapping at the corners. The required length will be three or four inches additional to the height of the patient, the width one inch more than the measurement across the shoulders.

To prevent rusting, the iron is shellacked or varnished and afterward wound or wrapped around with a bandage of cotton, or it is simply wrapped with a strip of adhesive plaster. The frame is then covered with canvas, excepting a two- or three-inch space in the centre, tightly laced on the under side, and the two layers sewed together at the ends. The opening for defecation corresponds to the distance from the head of the patient to his anal opening, the additional canvas surface uncovered by the body below the feet is required for the extension stirrup and strap. A piece of boiler felt about five by six inches in size is introduced between the two layers of canvas extending upward from the opening, thus making it soft for the sacrum. The edges of the canvas both above and below the opening may be covered with rubber cloth for a few

inches to guard against soiling. Traction of the affected limb is made with adhesive strips in the usual way, the cord from the centre of the stirrup block being attached to an upright steel piece slid on the lower end of the frame, of such height that extension can be made with the limb elevated, *i. e.*, in the direction in which it finds itself with the lumbar curve obliterated. Counter-extension is made through two perineal straps attached above to a steel arm arching over the hips from the affected side and firmly secured to the side bar of the stretcher. These straps pass down through the central opening and upward under the canvas and outward folding over the top of the stretcher to be pinned or sewed to the canvas. The only other attachments are shoulder straps with connecting webbing, sewed on either side to the canvas, not drawn tight, but sufficiently firm to prevent the little patient from rising. When found necessary, as with very restless patients, another attachment may be made of a metal arm springing from the side of the frame and arching over the lower third of the affected thigh.

For convenience of defecation, in the use of the *pot de chambre*, the stretcher is raised from the bed and under it are placed two rests, chairs, each made by bending a piece of bar-iron to the requisite height and length, secured below to a thin board. In using the chairs one is placed under the lower end of the stretcher first, that under the upper end last. The foot of the frame is first raised, that the extension of the limb be not interrupted. This apparatus —stretcher and attachments—need not cost more than from five to ten dollars.

My subject is the early treatment of hip disease. It called to a case for the first time, I would, within the hour, give the patient recumbency with stirrup and weight extension, elevation of the foot of the bed to secure body-weight counter-extension, and have this position retained while the stretcher-splint was being prepared; extension of the limb being made in the direction in which it finds itself with the lumbar spine flat on the bed. Often after a few days' traction the muscles so relax that the limb may be slowly lowered until the spine and inferior extremity are in a straight line.

The stretcher-splint being ready, the patient is transferred to it, the counter-forces, perineal straps and extension, being so nicely adjusted that the anal outlet corresponds to the canvas opening—at its

upper part. The shoulder straps are now sewed to the canvas—not, however, drawn tight. I have had patients, especially among the younger children, who manifested no desire to sit up, and thus on whom the shoulder and chest straps were almost superfluous. A small feather pillow is placed under the head and fastened to the canvas by thread or pin. A muslin cover placed over the canvas insures its cleanliness, or a quilted cover tied down on it additionally gives softness. The steel attachments are covered with chamois or red flannel; children are fond of bright colors, so additionally the perineal and shoulder straps may be covered with red. And, too, I prefer flannel as a material for bandaging the limb; it is elastic, it is warm, and again the red color is not objectionable. For perineal straps I use a boot strap webbing, so folded, with a strip within to stiffen, as to be three-fourths of an inch or more wide, covered with chamois or Canton flannel; in case of girl patients or where there is danger of soiling, a covering of rubber cloth is well. Cleanliness and a free use of powder prevent chafing. Two perineal straps are better than one, in that they fix the pelvis more securely, besides preventing adduction of the limb and permitting its rectification when it has occurred.

A small pad is placed under the lower third of the leg to prevent undue and painful pressure of the heel. There is a natural tendency to eversion of the foot, so extreme that at times it lies wholly on its outer side. To counteract this I have found small sand bags properly arranged around the foot and leg better than anything else. It is important, too, that the weight of the bedclothes be taken off the foot, either by a hooped arch or by a high steel foot upright. The top of this latter may be bent forward like a crane or inverted L (⅃) thus overhanging the foot.

If holes are to be made in the canvas for the passage of screws for the attachment of the accessory pieces it is best done by burning with a red-hot wire or awl. It will be observed that these accessory attachments have not disturbed the integrity of the iron frame; no holes have been bored into it which would weaken it, thus the strength is retained, and though if supported only at the ends it may bend slightly, yet it never breaks or becomes permanently bent.

It is interesting to note how rapidly the tension of the foot and perineal straps may be lessened; as the joint irritation diminishes the reflex muscular contractions relax, so that very soon only a slight

force is required to keep the limb extended. I have even loosened the perineal straps without injury.

On the stretcher the child may be carried from place to place With younger children the nurse or mother unaided can easily lift it. During inclement weather, such that the child cannot go out, I place him near a window that the sun's rays may play on him as many hours as possible. In pleasant weather the child should be out of doors almost constantly. The stretcher may be suspended as in a hammock, or placed on a little spring wagon, or in a large carriage, and thus change of air and scenery be afforded. I have thus transported patients many miles on the railway with comfort and without injury.

Playthings afford amusement, and thus the child is contented; shelves or a little table may be placed in front of the child on which interesting articles can be arranged. In one case the patient learned to play the zither during confinement. The head and neck, both arms, and one lower limb are free, and thus some little exercise will be had; if more is requisite, gentle massage of the body and exposed parts may advantageously be employed.

I have the testimony of mothers to the effect that they have less trouble with and can give better care to the afflicted little ones while being treated on the stretcher than when trying to get about on splint and crutches.

How long *may* and *should* patients be confined on the stretcher?

They *may* be confined without detriment until entire cure is perfected. I have had patients thus in recumbency for over eight months, cases that I did not see early, and that were attended with long suppuration, but who, to-day, are walking with only a slight limp.

They *should* be confined until the active disease is arrested, until the acute stage is well over. If seen early, and the constitutional taint is not too strongly marked, three months may suffice, more often four. The absence of pain and fever, the quiet sleep, the increased appetite and flesh, the playfulness, all indicate subsidence of local irritation. The charge has been made that this increase of flesh "is the fat of inertia," and therefore not healthful or commendable. To this I would say, that it is a pretty good sign when a patient with general or local tuberculosis increases in flesh, with

the appetite maintained, and the normal functions of the body healthily performed. I have never known a patient to suffer injuriously from the recumbency, and have known of but two deaths where the stretcher had been used—one of tubercular meningitis in which the patient was apparently progressing well and without abscess, but in whom the hereditary constitutional taint was very strong; the other was complicated with tubercular involvement of the kidneys and other organs. It was double coxalgia, the opposite hip having been diseased the year previous. The patient's older brother had died of Pott's disease. The tubercular cachexia was apparently too marked and too general to be thrown off; beside, the disease had advanced far, under improper treatment, previous to the case falling into our hands. Children bear confinement well, because so short a time has elapsed since, as infants, they were lying all the time.

Abscesses are less likely to form by this method of treatment, as the local irritation is so rapidly checked, or, if found, they are readily and more satisfactorily treated than when the patients are up and about; the quiet insures no disturbance of the dressings, and less fear of downward burrowing.

As to general treatment, we have no specific to cut short the tubercular process, if that be present. What results may be had from benzoic acid and creasote remains to be determined. The hypophosphites, cod-liver oil, malt, et cet., are proper if the stomach does not rebel. Good diet, milk and cream, fresh air, sunlight, cleanliness, sponge-bathing, rubbing of the arms and unaffected limb and body, all have their place. The exhibition of a mild mercurial purge every fifteenth day seems to assist the secretions.

In predicting a seemingly glowing prognosis I do not forget that we will occasionally meet cases in which the cachexia is so strongly marked and with so little constitutional viability, either hereditary or acquired, that, despite our best efforts, they drag their slow length along with discharging sinuses and destructive caries. Such cases try our patience and test our resources, yet perseverance may not only save life, but preserve a fairly useful limb.

It has been asserted that traction is only a means to immobilization, and that it is beneficial only so far as it fixes the joint. I should not thus limit its action. The muscles have been goaded on

to reflex contraction which the continuous extension of the weight will overcome. The relief from pain and the sound sleep assured, after nights of wakefulness, simply by the application of weight and stirrup are due to something more than the mere immobilization afforded. The joint irritation once diminished and the limb straight, it is striking to observe what slight traction is afterward necessary, as previously observed, to retain the limb in correct position and in comfort.

I believe that more prompt relief, more rapid arrestment of the disease, and more comfort are given the patient by a happy combination of the two therapeutic indications, traction and immobilization —especially true in the earlier stage; and the stretcher splint best meets this end. No other hip splint with which I am familiar so combines these two important indications. The Davis-Taylor-Sayre splint claims only traction, intentionally permitting motion (see joint between hip band and side bar), and suggesting that movement can be had without friction. Contrary, however, to the intentions of its designers, it does, to a slight degree, modify the movements of the joint (hip); not from grasping the pelvis—the hip-band is too narrow and too loose for that—but by drawing tense the muscles passing between the pelvis and limb, as the shrouds pass between the hull and the mast of a vessel. A naked mast could readily be toppled over, but, with its shroud-ropes drawn tightly, it becomes immovably fixed. So, too, a tall iron smoke-stack unsupported would be dashed to the ground by the first passing breeze, but guyed to the ground by tight chains, it becomes firmly fixed. Thus, likewise, traction on the limb draws tense the muscles surrounding the joint, and to a degree fixes it. It is this limited, unintentional fixation added to its crutch principle that renders the splint at all beneficial. The Thomas splint claims only fixation, repudiating extension, and yet a pendent limb drags somewhat on the hip-muscles (so much so that the late Dr. Hutchinson considered it a strong and sufficient element in the indication for cure, too sweeping by far), and what slight traction the weight of the limb exercises does add beneficially to the fixation action of the splint. I am not aware that the efforts to add traction power to the Thomas splint have as yet been practically successful; I hope they may be, though the distinguished author himself repudiates the idea of any such necessity.

We certainly regret the armed antagonism which Mr. Thomas and some of his followers maintain toward the principle of extension in the treatment of hip disease, for a long experience has proved it beneficial. It certainly does no harm, and why ignore and condemn any therapeutic indication that may benefit the patient?

Extension is especially beneficial during the earlier stage, while the reflex muscular contractions exist; later in the affection it is not so necessary, and fixation alone may be relied upon. Thus I believe and practise. Late in the disease the convalescent patient may be gotten off his stretcher and placed on a simple fixation splint, Thomas's, or gypsum, or leather (French method); the last two passing well up to the axillæ and down to the ankles; patten and crutches being used in these cases. Still later there may come a time when the perineal crutch-splint, made without joint at the hip, as used by Dr. A. B. Judson and others, will meet the indications.

REST AND FIXATION IN JOINT DISEASE.

By DE FOREST WILLARD, M.D.,
PHILADELPHIA.

Mr. H. O. Thomas, of Liverpool, in his latest fulmination,[1] takes occasion to object to my methods of producing fixation in joint disease. While I as thoroughly believe in the necessity of *rest* as does Mr. Thomas, or any other member of the profession (since it is not only correct in theory, but in practice also it has yielded me the best results), yet I cannot agree with him that it is only to be obtained by the use of the Thomas splint. I believe that rest to a joint can be obtained in a variety of ways, and any plan that will produce this result will give good cures. The means may differ according to the judgment of the surgeon. I am satisfied that excellent results follow the use of the Thomas splint, but I do not think they are caused by this particular form of splint as much as by the long-continued application of the principle of rest for month after month. If I understand his method correctly, his custom is never to allow the removal of the splint during the entire course of the disease. In my opinion it is largely this persistence, combined with the fact that his cases are all in private practice, that secures the excellent results that he reports. I confess that such absolute rest is not obtained in the practice of the majority of American surgeons, since with nearly all of them a certain amount of motion is undoubtedly produced in their efforts to obtain cleanliness. English mothers must be far different from those in our country, if they permit their children to continue for such a length of time without securing for them that condition of cleanliness which is so important to health.

Mr. Thomas asserts, on page 5 of his article above mentioned,

[1] An Argument with the Censor of St. Luke's Hospital, New York. Pamphlet. Liverpool, 1889.

"that every case of hip-joint disease can be cured without leaving a fractional deformity of flexion, and consequently, without any shortening, except that either arising from the arrest of growth, where inflammation has interfered with the growing points in the upper parts of the femur, or from erosion, no matter whether the case goes on to suppuration or not, or is even presented to us for treatment in an advanced stage of suppuration." If he can prove by statistics that this remarkable statement is true, that *all* cases, *suppurative* or *non-suppurative*, can be thus cured without even a "*fractional deformity of flexion*," and "*without any shortening*," then I shall be exceedingly glad to abandon any form or plan of treatment which I have either practised or seen practised in the past. We are accustomed to see some beautiful results in carefully managed cases in private practice, but to obtain such perfect cures in "*every case*" has never been reached.

I do not argue against the Thomas splint; on the contrary, I have used it with good results, and I believe in it because of its fixation powers, but I do not believe that it is the only splint that produces rest. Rest can be secured by traction, by leather appliances, by plaster-of-Paris, by wood, by binder's board, or by any rigid material; even traction splints produce a certain amount of rest. The secret of success, in my opinion, consists in carrying the splint far enough above the hip-joint to produce a certain degree of fixation that will approach most nearly to absolute rest. I do not believe that absolute rest, in its true sense, can be obtained, but we can approximate it. Any splint, therefore, which is intended to secure rest must reach to the thorax above and to the calf below. Upon this condition, rather than upon any particular form of splint, success depends. My objection to all splints that have only pelvic bands, is that the seat of motion is moved upward to a point in the spinal column only a few inches above the diseased region. By transferring it higher to the dorsal portion of the spine a far greater degree of rest is secured at the hip. This is the element which is especially valuable in the posterior bar splint, and is another of the great secret of its success.

The posterior bar, however, is not as effective for a protection splint as is a modification which I have frequently used, and which adds an additional lateral bar, thus securing protection of the joint against blows, particularly during falls, which must occur with considerable

frequency in all children after they are permitted to go upon crutches.

The other essential element of rest in every form of treatment of hip disease, consists in the use of *axillary crutches;* in fact, were I compelled to be limited to the use of a single item of the many paraphernalia for the treatment of this affection, I should choose the axillary crutches, believing that by their use alone fair results could be obtained. I object to perineal and ischiatic crutches, from the fact that their use brings traumatism, in walking, too close to the seat of the disease. Jarring and concussion are produced at every step, while with axillary crutches and a high shoe on the sound foot, the motion imparted during movement is simply a swinging one. It is with this idea in view that I occasionally try Hutchinson's method among poor patients; not that I consider surgery a "caste art," as Mr. Thomas seemed to suppose, but simply because it permits us to give patients a fair degree of treatment without any cost, and, therefore, it is a benefit in cases where nothing better is possible. Very rarely, however, should this plan be employed.

Absolute rest is not secured by the Thomas splint, unless English children are different from our own. With this splint it is impossible for patients to sit with any comfort, except upon a high chair. Children will sit, and in doing so considerable *twisting of the limb upon its long axis*, is the result.

The avoidance of this hip-straining motion first led me to adopt, in certain non-acute cases, a form of splint with unlocking joint, in which the joint was temporarily released when the child sat, flexion being allowed so that sitting became easy, and the patient was made comfortable on an ordinary chair. This splint, which bears my name, is accurately fitted to a plaster cast of the body from the thorax to the leg. The material is partially tanned leather moulded when wet, and dried upon the cast. The truncal section is united with that of the thigh by a joint opposite the hip, which joint can be locked or unlocked as desirable. I acknowledge that this permits temporary motion, but protection of the joint is constant, and the amount of motion is but little; the injury to the joint is less than is the strain caused by the twisting of the joint while wearing a posterior bar. I have the advantage of having given personal supervision to *both* forms of apparatus, and know whereof I speak.

I have never claimed that a splint, which allows even temporary flexion of the hip-joint, is suitable for any other class of cases than those that have passed the acute stage. During the acute and painful stage I consider absolute rest essential, and, by rest, I mean rest in the horizontal position, with support of the limb and body by sand-bags, side splints, posterior splints, or any other form of fixation apparatus that may be selected by the surgeon. In this stage, I know from experience that traction is useful; traction by pulley and weight *in the line of the deformity.* Why Thomas objects to this I cannot imagine. It certainly assists in procuring rest by tiring out and tranquillizing the muscles which have been thrown into a state of reflex spasm by the disease. It is a principle which is well recognized in the whole surgical world; it gives comfort, relief from pain, and greatly shortens the stage of starting pains. I do not believe that it produces any distinct distraction of the joint surfaces, but it does modify their contact, and, as I have stated, is an important element in furnishing rest.

I cannot see any difficulty in the plan (which is so common in this country) of bed extension, where lateral and downward traction are first made so that their combined force is exerted in the line of the deformity, and then altered day by day until a straight position is reached, and I know that it is more comfortable to the patient than is the "lever principle" when it is brought to bear upon the articulation.

While not a believer in the power of a "traction splint" to produce in the erect position any appreciable traction during the *critical moment when the weight of the body is brought upon the perineal straps*, yet even this splint does modify surface contact, and, to a certain extent, protects and gives rest to the inflamed bones. Thus far it does good, and I know that its advocates are honest in their belief of its efficiency, and that they do secure some good results. I believe, however, that they would increase their percentage of satisfactory results if they would study well the less amount of traumatism inflicted, and the greater amount of traction secured by the weight of the protected limb at the moment above mentioned, when axillary crutches are used.

I have learned not to rely upon a single method of treatment, but to secure all the good that can be obtained from any plan of theory

or practice. I am convinced that rest of the joint is the positive element in preventing, aborting, and lessening inflammation.

I regret that Mr. Thomas has not been able to understand my expression that "cases of traumatic origin can, within the first ten days, be easily checked."[1] My intention was to emphasize the fact that treatment by rest was far more effective when cases were secured within ten days after traumatism than when it was applied at a later date. My argument was to induce surgeons to apply at once the abortive treatment as soon as muscular rigidity appeared, not to permit the case to go on to a full stage of inflammation while they are endeavoring to form a diagnosis. I argue that the treatment should be commenced immediately upon the first signs of the difficulty, viz., muscular rigidity and slight limp. With so serious a disease we cannot afford to neglect the early indications.

A few sentences in my article should, in my opinion, have made the meaning perfectly clear. "The limb, under no circumstances, should be placed upon the floor, and until pain and all signs of acute inflammation have subsided, the recumbent position should be unceasingly maintained."

Again, on page 5 of the reprint named I distinctly state that "if the case is osseous in its origin, *several months* should elapse *after all cessation of pain* before crutches be permitted," and on page 7, "after all pain has ceased for *months*, some form of apparatus should be applied to prevent joint motion, and yet to permit the patient to move about on crutches, and with a high shoe on the sound foot."

Unless serious complications arise, and if the hygienic surroundings are good, the period of horizontal rest, fixation, and extension may frequently be prolonged with decided benefit. No impairment of health need result in the majority of cases, provided the patient be placed upon a light platform, with mattress and extension apparatus, as advised in my article, since it can thus be easily carried out of doors and placed upon a wheel framework, or on chairs, and thus an abundance of air can be obtained without any disturbance of the joint. Bradford's frame, or a wire cuirass, or a gypsum case, answers a like purpose. Fresh air should always be freely admitted to the room. The instances in which confinement to the bed has

[1] Rest and Fixation in Joint Diseases. New York Med. Journ., Dec. 5, 1885.

been followed by impairment of health are certainly few in comparison with those that have been injured by lack of such treatment. Long immobilization certainly does not produce ankylosis, but it does prevent it.

Thomas insists that his splints should be made of malleable iron strips, and he claims that steel is unsuitable. My experience with iron bars has been that when a child sits or brings any strain upon them they assume a position of greater flexion than before, and *remain there* This requires almost daily straightening in order to maintain a proper position. Such bending and straightening disturb and produce motion at the hip-joint. A stiff spring-steel strip will bend no more under force which may be applied; in fact, it does not yield so readily, and it immediately returns to its original position. It can be straightened from time to time by wrenches with perfect ease, as necessity requires, and, in my experience, it is superior to iron, although Thomas's large experience is justly entitled to great weight.

I do not argue against his methods. I only claim that the same results can be obtained in a variety of ways. No individual should be limited to a single splint, for it is not the splint that cures hip disease. Such a result is only to be obtained by the most careful and constant supervision of the various steps of the case in its several stages for many years.

We are to keep constantly in view the prevention, limitation, and reduction of the inflammatory process, while at the same time we so fortify the general health that it may successfully combat and at last throw off the destructive tuberculous process.

As I understand it, all of Mr. Thomas's cases have been in private practice. It is not strange, then, that he should secure good results. This class of cases in our own country will also yield admirable statistics, but in the great crowd of drifting dispensary cases, where any form of treatment is given but a small chance of success from the neglect of even simple directions, it is not strange that most direful results are seen. I have often seen cases where even the plainest injunctions have been absolutely disregarded, and yet the surgeon or the plan of treatment has been compelled to bear the blame of failure.

THE OPERATIVE TREATMENT OF HIP DISEASE.

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I TRUST that it will not be inferred from the title of this paper that I look upon the operative treatment of hip disease as the chief element in the management of this affection; on the contrary, I regard mechanical and hygienic measures as of the greatest importance, and acknowledge that operative procedures are, like amputations, confessions of defeat.

Yet operative measures are necessary in a considerable number of cases, and as this portion of the discussion has been assigned to me for consideration, I shall endeavor to deal with it alone. The other varying aspects of this disease will be presented by other surgeons, since it would be impossible in any one article, outside of an exhaustive treatise, to deal with this subject in all its bearings.

It may, perhaps, be very justly claimed that there are two classes of orthopedic surgeons; the one, viewing apparatus alone as the chief element in the cure of malformations and of deformities; the other class regarding orthopedic surgery as a branch of general surgery demanding the highest degree of general surgical knowledge and skill, yet insisting, in addition, that mechanical measures and the various forms of apparatus, both before and after operation, are of just as much importance as is a splint after the reduction of a fracture, the necessary reduction and adjustment of the fragments being but a small part of the cure.

Relapses and poor results will occur in the hands of the most careful orthopedic surgeons from neglect and ignorance on the part of the patient, but the worst and most frequent failures are found in the cases where the surgeon, by his words and acts, gives rise to the assumption that he has cured the disease by operation alone. I

acknowledge that my predilection and surgical training render me partial to the speedy results of the knife; yet I value in the highest degree mechanical measures both before and after operation.

A wise decision as to the class of hip cases requiring operative means is an exceedingly important one. I must confess that I am often puzzled in regard to fixing an absolute line beyond which it becomes imperative to interfere. I should be exceedingly glad if this American Orthopedic Association could agree upon absolute rules in regard to cases that should, or should not, receive operation; but from my knowledge of the practice and teaching of the several members composing this important body, I am sure that there would be great diversity of ideas and of practice. Of course, there is a class of cases concerning which there is practically no question as to the justifiability of interference, although some surgeons contend that excision is useless in this late stage, and that drainage alone is then helpful. This class includes cases in the third stage, with multiple sinuses pouring out unhealthy pus, which drain is rapidly exhausting the patient and threatening dissolution. Other cases demanding interference are those showing undoubted evidences of extensive disintegration of tissue with great flexion and adduction; as, also, those extremely painful cases of caries sicca, where, without suppuration, the patient sinks and all forms of mechanical treatment fail to give relief. Albuminuric cases also, and those showing evidences of waxy changes can often be benefited by removal: but all these cases have for years been looked upon as at least justifiable ones for operation.

With increased knowledge, and especially with increased facilities for operation due to the greatly diminished risk in antisepsis, we ought to advance our lines and rescue a larger number from the tedious delay and crippling results which are so common in this disease. These cases deserve at our hands the most careful attention that care and skill can give them, and American surgery, quick to embrace successful practice, no matter from whence it is originated, should give no uncertain sound.

As to the necessity of operation, much will depend upon the condition and surroundings of the patient. It is very justly claimed that in many cases operative means are unnecessary, and there are many surgeons who hold that excision is never necessary. Person-

ally, I can say, as regards the value of careful attention and strict mechanical control that I consider them so valuable that I have never excised a hip-joint in private practice where the individual has been under my care from the inception of the disease. I believe that it is very rarely required under such circumstances, but there come to all of us a great mass of cases with hips riddled with sinuses, pouring out quantities of pus, whom we cannot retain under our care with any certainty that a single instruction will be thoroughly followed, but with the almost absolute certainty that the disease will rapidly progress or that death will follow. This class of cases stands upon an entirely different basis, and must be treated in the way that will give the best results in the shortest time, and we cannot hope to accomplish even that little unless they are received into the wards of a hospital. Instructions that are disobeyed, apparatus that is misapplied, can never give good results.

Before operating it is important that we consider three questions:

1. Is life saved?
2. Is time gained?
3. Is the resulting limb more useful?

I. Is life saved? To answer this question properly would require, first, a careful study of what may be called the natural death-rate from hip disease practically untreated, and secondly, when carefully treated with the utmost attention to every detail and by various forms of mechanical appliances. It is exceedingly difficult to classify statistics upon this point, because there are only a few cases in which a certain form of treatment is not instituted, and secondly, even with apparatus there is the greatest diversity of methods. In the large majority of cases treatment is interrupted by the patient being placed in the care of some other physician, and thus the course of the case in its entirety is lost, and it becomes valueless as regards statistical importance. This is true more frequently as regards hip disease than of other conditions, for the reason that treatment of these cases extends over several years, and there is, therefore, greater opportunity for such change.

Judging from Thomas's statements, we would consider that all cases, even suppurative ones, are curable without deformity, while Hueter takes the gloomy view that only fifty per cent. of suppurative

cases, with flexion, adduction and internal rotation, heal: in fact, he looks upon tuberculous suppurative cases as practically hopeless.

Gibney, in eighty cured cases found that forty-eight at least had had abscesses. Yale gives the death-rate of conservatively treated cases, without operation, as thirty-one per cent.; Gibney, twelve per cent.; Clinical Society of London, thirty-three per cent.; Taylor, two and one-half per cent.—the latter all in private practice.

My own estimate of the natural death-rate in this country would certainly not fix it above fifteen to twenty per cent., while in private practice the result would be far below this figure.

The death-rate from excision, like that of the normal death-rate referred to, varies exceedingly and gives rise to as great a diversity of opinion. Leisrinks gives sixty-three per cent.; Sayre, thirty-four; Culbertson, forty-one per cent.; London Clinical Society Report, thirty-seven; Caumont, before the use of antisepsis, sixty-six, after its introduction, forty-one (eleven per cent. died from the operation). Wright, out of 1700 collected cases makes it thirty-three per cent., which seems a fair deduction.

The saving of life is, of course, the most important consideration of the surgeon, but if the question were to be considered from this standpoint alone, we should at once join the ranks of those who advise early excision, since the risk from operation at that stage would not be great, and in many cases of tubercular affection death would be avoided. Carrying out this line of reasoning, we should arrive at the *reductio ad absurdum* that all cases of hip inflammation should be excised so early that there would be no possibility of there being any other than a local difficulty.

It would be obviously unfair, however, to compare the results of excision with the results of all classes of cases dying from what may be called the natural results of hip disease, since operative cases, as a rule, are selected from the very worst. The only just method of comparison would be to compare 1000 cases of excision with 1000 equally serious ones which did not receive operative treatment. Could such a comparison be instituted, I believe that the operative course of treatment would yield a less percentage of deaths than the more conservative plan, while at present it occupies a higher place. Were we to compare early resection with similar cases where rigid rest has been secured to the articulation during treatment, doubtless

lives would be saved and time gained by the former plan; but as regards locomotive powers the balance would be in favor of rest.

Wright states (*British Medical Journal*, December 15, 1888) that incision has not given him any better results than excision; consequently we may for the present line of argument practically consider them as one operation.

But even if the saving of life is the prime consideration, other objects must not be overlooked. A large percentage of operative cases die from lardaceous degeneration, or exhaustion from suppuration, or from tuberculous conditions; few from the operation itself.

II. Is time saved? With the practice of antisepsis, which favors rapid healing, we frequently obtain speedy closure of the wound. If any one wishes to have excellent statistics let him report all cases about the sixth week "perfectly cured." But wait a few weeks more; a small sinus appears, a long period of suppuration follows, and the patient either finally dies, or is cured at the end of possibly a little shorter period of time than would have been occupied by a natural cure, but the limb is less useful as a walking member. Even Croft, who favors early excision, acknowledges that the majority of his cases require close watching from one to two years after excision, one-half of them two years, and that ultimate suppuration is very likely to appear.

The cases reported within a few weeks, or even a few months, after the operation, are not relapses. The disease has continued uninterruptedly in spite of operation; but, as in non-operative cases, the pus has been slow in coming to the surface. True relapses are so common in apparently cured cases as to warn us against too great enthusiasm. I am at the present time treating five cases of relapsed hip disease that have returned after forty-five, nineteen, sixteen, ten, and six years respectively. In removal of diseased bone tissue, either by excision or by erasion, the underlying layer of bone cells is necessarily injured, and the inflammation thus set up causes caries, with opening of the sinuses and suppuration for a certain period of time. To minimize this element of failure the scoop should be very sharp, and all fragments could be washed out immediately.

III. Is the limb after excision as useful as the one in which nature, assisted by the surgeon's care, is capable of securing? In the large majority of cases unquestionably No. The loss of the bone, even

in one of the worst cases of disintegration of tissue, is seldom as great as in complete excision where the trochanter major is sacrificed. Even in suppurative cases, where there has been absolutely no operative interference, where the joint has been thoroughly fixed, and ankylosis has been secured, the result is an excellent walking member, and the vertebral column (especially in a child) gives wonderful compensatory movements. For the working man or woman a stiff joint is incomprehensibly better than one in which the pelvis is insecurely steadied upon the femur, while extensive resection in early childhood may by the removal of the epiphysis so interfere with the growth of the member that the limb may be rendered almost useless as a functionating part of the body. The report of the London Clinical Society was decidedly of the opinion that the result was less useful, and I must confess that my results after excision have not been satisfactory; even when treated with care, with rigid antisepsis, and with subsequent attention to fixation of the joint for one or two years, a large majority of cases, six months after leaving the hospital, have been found to be suppurating. I speak of hospital cases, as, under proper care, operation is seldom necessitated in private practice.

It is sometimes argued that the most direful results obtained are those seen in the hands of the best hospital surgeons, which is undoubtedly true, from the fact that hospitals receive the very worst class of cases. Frequently the case when brought to the institution is already in the advanced stage of suppuration, with involvement of both femur and innominate. Few dispensary out-patients can receive the close attention that is so essential in the cure, and without it even well-ordered measures will fail for want of attention to detail at the hands of ignorant mothers.

Yet, looking at hip disease in the light of present pathological knowledge as a local bone tuberculosis, the most rational theoretical method is to rid ourselves of the dangerous material, if possible, before the general system becomes infected. Is it possible to do this? In the present state of our knowledge we must frankly answer, we do not know. First, because we cannot be certain as to the exact number of foci that exist, and, secondly, we cannot fix the time at which general infection commences. We know that the most common point

is near the epiphyseal line, but as to the rapidity of either local or systemic infection we have no certain knowledge.

The fact that pus has formed and has escaped from the capsule is sufficient cause for grave apprehension as to the result. But what course are we to pursue as to its removal? Although correct in theory, I am not prepared to advocate what is known as early excision. I abhor retained pus, and yet, I have before my mind too many cases like the following:

A., aged eleven, female, with long, unmistakable signs of hip disease passing through its various stages; abscess tumor appeared on the front of the thigh; by aspirations, in each of which operations sero-purulent material was abstracted, and by the employment of rest the symptoms became quiet, and the case cured without pus appearing at least on the surface. She has now been walking about in perfect health for eight years.

C., a case in which localized swelling was so great that I was called in consultation to open the abscess; undoubtedly hip disease in acute stage, but which, under proper treatment, after eighteen months shows no signs of suppuration, and bids fair to recover without loss of joint motion.

Such cases cause one to hesitate when the symptoms are not very serious, and the surgeon in all these doubtful cases should go carefully over the whole ground, taking into consideration, in connection with the local symptoms, the surroundings of the patient, the general condition of health, and the ravages of the disease up to the present time.

On the other hand, I can recall many cases which were making favorable progress, and yet suppuration has suddenly appeared, and the patient has died from long-continued drain, or from lardaceous degeneration, or from tuberculosis. Others, where operation has been refused, have taken the same course. In cases where there are reasonable signs of pus formation, and yet where the existence of abscess is not positive, even though thickening and induration are markedly present, we can often afford to wait until the diagnosis is more thoroughly established, feeling confident that injury to the general health will seldom result.

Incision, erasion, and drainage, as described in a later portion of this paper, sometimes offer better hope of relief than excision, on

account of the thorough removal of all portions of the tuberculous material, both of hard and soft parts; but I have not practised this plan of complete removal for a sufficient time to speak emphatically in regard to its value, as it will require several hundred cases to yield reliable results. In theory it is correct, and it has given excellent results. I cannot boast of such brilliant successes as have been reported by Barker (*Brit. Med. Journ.*, Dec. 15, 1888, p. 1336), yet a close examination reveals the fact that his cases, months later, showed evidence of a continuation of the disease, even though prompt healing had taken place.

I look upon all pus confined in the body as an element of danger, and upon tuberculous material as especially fraught with risk. I do not overlook the fact that our very efforts at removal of this tuberculous material may be the means of causing bacillary infection, and that we may hasten general tuberculosis. It is on this account that I advise the letting alone of the abscess unless thorough removal is decided upon. Partial removal is dangerous. Neither do I overlook the fact that encapsulation, caseation, absorption, or organization of the tuberculous foci may occur. Yet, on the other hand, such foci may be a menace to the constitution for many years.

The worst argument against thorough removal and rigid extirpation of the diseased tissue is the fact that Volkmann, who followed this plan for some years, was disappointed in the results. After reëxamination of his cases he found that relapses were not uncommon. In this respect he seems to have had similar results to those secured by the rest of us.

The principal measures practised for the relief of the various stages of hip disease are:

I. Aspiration of the fluid in the joint.
II. Ignipuncture.
III. Trephining or drilling.
IV. Aspiration of abscesses more or less remote from the joint.
V. Incision of the abscess.
VI. Incision, erasion, and drainage.
VII. Excision.
VIII. Amputation.
IX. Osteotomy.

I. *Aspiration of Joint Fluid.*—While thoroughly of the belief that the overwhelming majority of cases of chronic hip disease are evidences of tubercular osteitis, caused by slight injury, there are a certain number of instances of primary joint inflammation that require treatment in order to prevent the degeneration from involving the bone structure and then becoming tuberculous. The surgeon who does not treat cases that are diagnosed as "contusion of the hip" with this possibility in view, is not only reprehensible for short-sightedness, but is committing a crime against his patient. The progress of the majority of these cases is hopeful. Distention of the joint by serum will necessarily produce flexion, abduction, and external rotation; and to employ traction in a straight line, without the removal of the fluid, provokes muscular spasms and produces pain. If the removal of the fluid is contraindicated or declined, traction and fixation in the line of the deformity are permissible. Should rest, or traction, or both, produce no relief within a few days, then, with a clean instrument, clean hands, and clean integument, no harm can result from aspiration. When there are evidences of increased thickening about the joint, indicating that the fluid has degenerated into pus, removal of the articular contents is advisable: the joint may be reached posteriorly or anteriorly. I prefer the former route, but am guided by the nearness of the swelling to the surface. The amount of the fluid is limited unless the capsule is ruptured. Great benefit will ensue provided rest of the joint follows, and instructions are strictly followed for a long time after all apparent symptoms have passed away.

II. *Ignipuncture.*—This, as practised by Park, Bradford, and others, consists of electrical tunnelling of the bone, or cautery by electricity. It is occasionally valuable, and would often be of more service if we could be assured of the correct situation of the tuberculous focus. Uncertainty upon this point, however, will, for the present at least, permit it to be only occasionally employed. The puncture is usually made over the trochanter, and the cautery is caused to enter the longitudinal axis of the neck of the bone until the epiphyseal juncture is reached. Good drainage is thereby secured. If all bacilli could be destroyed a rapid cure would result.

It will require further tests before it is recognized as an established procedure.

The actual cautery may sometimes, I suspect, in the olden time

have been buried in the bone by Pott, Brodie, and others. This method, which we now so greatly decry, secured to the patient a long period of enforced rest from which benefit was derived, and thus the agent became a large factor in the cure.

III. *Trephining and Drilling.*—From this plan of operation much benefit doubtless would be obtained if, as in the last-mentioned plan, we could locate the exact position of the tuberculous focus. Unfortunately, howevever, this is usually impossible. Lovett states that much relief can be obtained by the evacuation of the products of inflammation by this method. He cut a quarter-inch hole through the neck of the femur with a trephine, and curretted and drained thoroughly from the bottom of the cavity. The temperature in his case ran up to 104.5°, but he states that cure was facilitated. It seems to me that cases requiring ignipuncture and trephining would be better treated by exploratory incision, followed by erasion or excision.

IV. *Aspiration of the Abscess.*—As long as there is the slightest doubt as to the existence of pus we can well afford to delay, even though confined pus is an element of danger. Many surgeons advocate the plan of letting these abscesses absolutely alone, as statistics prove that the danger to the constitution is not thereby greatly increased.

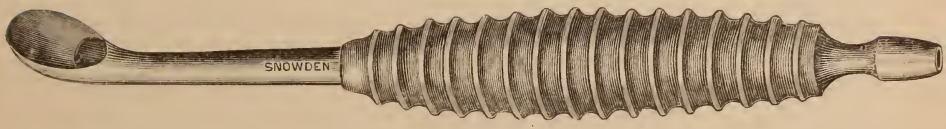
An important element in the diagnosis is the use of the aspirator. Thorough antisepsis must be employed, and it must be certain that no element of suppuration is introduced by the operator. A needle of large size should be employed, and if the fluid secured is seropurulent in its character, or if we have the liquefaction of caseation, I have found that it is wiser to continue this plan of operative procedure as rapidly as the abscess becomes filled. In many cases absorption or organization has occurred, and the case has gone on to excellent cure without any pus finding its way to the surface, although the use of the aspirator is usually described by surgeons. When the instrument reveals true pus one of the two following plans of treatment must be instituted, unless we decide upon the let-alone policy. If it is decided simply to evacuate the pus without any more thorough operation, I decidedly prefer the plan of drawing it off through a large aspirator, and injecting into the cavity of the abscess ten or fifteen grains of iodoform dissolved in glycerine and

distilled water. This should be allowed to remain, the object being to excite just sufficient inflammation to strengthen and thicken the walls of the abscess, which is nature's method of protecting the system from injurious invasion. This strengthening of the sac is the sole object for which I employ this plan of treatment.

V. *Simple Incision of Abscess.*—When pus is absolutely proven to be present the question of its evacuation becomes an important one. This has already been discussed by another member of the Association, and I will not delay you further than to cite my individual plan in dealing with these abscesses. As a rule, I prefer to abstain from any interference until I am positive as to my plan of final action, or until the consent of the patient has been secured to the necessary operative procedure. Should the major operation be declined, or if there are any contra-indicating symtoms, simple incision and drainage are most desirable under strict antiseptic precautions. I have already described how preliminary aspiration should be performed in order to diminish the risk from bacillary infection through the walls. The incision should be made at the point of the tumor which will give the greatest drainage. Frequently it is desirable to make two openings, so that "through and through" drainage may be secured. In all cases of simple incision of abscesses it is my chief object to avoid any pressure upon the abscess wall lest fissure occur, and bacillary infection follow through this route. The contents of the abscess should never be pressed out, but should be removed by a gentle current of hot sublimate solution until the major portion of the contents has been evacuated. A bulky antiseptic dressing should be applied without undue pressure, and should be allowed to remain until signs of decomposition appear, be it days or weeks. Disturbance of an abscess is as injurious as is the opening of a fresh wound. A drainage-tube should be inserted at the time of the operation, but should be slowly withdrawn day by day. Subsequently antiseptic washing may be practised according to the view of the operator. So long as there is no pocketing of the pus I prefer to let it escape by free drainage rather than by forcible pressure.

VI. *Exploratory Incision, Erasion and Drainage.*—There is no special form of incision which should be followed, even when it is possible that the operation will end in excision. If the abscess has not yet opened, the most dependent portion of the prominence should

be selected, avoiding the large vessels and nerves, and also paying attention to the integrity of the muscular fibres as far as possible. If sinuses exist, two or more of them may be connected, or the more prominent ones may be followed to the diseased bone. The bleeding vessels should be secured and irrigation by hot sublimate solution (1 to 1000) be instituted so as to form a protective layer of coagulated albumen upon the freshly cut surface, thus assisting in the prevention of tuberculous infection. Thorough exploration by the finger and probe will then disclose the origin of the pus. It is possible that the joint will be found open; if so, no harm will arise from enlarging the wound sufficiently to admit the finger, and thus determining whether the disease is limited to a small area. The scoop is now brought into use and every particle of diseased tissue that can be reached either in the head or neck, or synovial membrane, or in the acetabulum, or soft surrounding tissues, is cut away. For this purpose I prefer the hollow-handled sharp spoon here shown, as it enables me to work more rapidly, and at the same time it supplies a constant current of water, and thus destroys all germs before they have an opportunity to



infect the incision. It is simply a sharp Volkmann spoon with a bulky handle tunnelled longitudinally with a large bore so as to allow free ingress of water from the feeding rubber tube, which is connected with a reservoir, or jar, or rubber bag. The device of Barker's for shutting off the flow of water is entirely unnecessary, and is cleansed with difficulty. The carpal portion of the operator's hand makes an efficient valve and is easily employed for the arrest of the current when necessary. The length of the tube and the height of the jar, or fountain syringe, must be varied according to the rapidity of the flow desired. This hollow instrument gives the operator control of the current and leaves him free from the presence of an assistant's hands.

The erasion must be carried well beyond the seat of the disease, and for this purpose a curved gouge is sometimes necessary. If the head or other portion of the bone is loose the rough ends must be

sawed off or gnawed by strong rongeurs, and all fresh foci discovered in the bone similarly treated. The knife and scissors are then brought into use, and all possible fragments of the diseased tissue entirely cut away. All sinuses should be opened if possible, and the entire walls, together with those of all abscess cavities, should be removed until healthy tissues are reached. After rendering the wound thoroughly aseptic, we may permit it to fill with fresh blood-clot for organization; the wound can be closed dry with catgut or rubber drainage according to the judgment of the operator. In the majority of cases I regard it as far more important to effect a thorough cure than to secure primary union. Rubber drainage is, therefore, preferable, especially when there has been extensive bone disease, as it counteracts any error that is liable to occur even with the most careful antisepsis. If these tubes are withdrawn a half-inch at every dressing, it will accelerate the healing and will lead the pus down their track. They are usually too long retained. A large antiseptic dressing should be immediately applied, firm pressure being made over antiseptic wool.

In the discussion upon this method which developed in the Royal Medical and Chirurgical Society (*British Medical Journal*, December 15, 1888) absolute antisepsis, subsequent attention, and absolute rest were insisted upon. It was shown by Croft that while in 1880 the mortality after excision was thirty-three per cent., it is now diminished by antisepsis to fifteen per cent. The anterior incision of Hueter for erasion was recommended, although thorough removal and drainage was more difficult. Wright, who had excised one hundred and thirty-five times in his last eight hundred cases, thought it impossible to remove all the diseased tissue, and as a single focus remaining might, on slight traumatism, arouse inflammation and bring on a relapse, he still believed in drainage. It is certainly impossible to secure a clean fresh wound in every portion where there has been a large amount of disease and extensive suppuration. The subsequent dressing is by weight extension over a pulley, with perfect rest, good air, and continued fixation.

The temperature chart is the most valuable index of the accumulation of pus, and every rise indicated should be followed by a careful examination of the region. I am still searching for positive rules to guide me in the indications for excision, erasion or drainage, but in

the worst cases, in the freely suppurating ones, and those that are rapidly failing, there can certainly be no question as to the propriety of such procedure.

Frequently, when an exploratory incision has been made with the idea of removing the diseased portion by erasion, excision will be the final result of the operation. It is not to be expected that erasion can take the place of excision. It is simply to be employed in cases where the destruction of the bone tissue has been small.

VII. *Excision.*—As the question of excision of the joint will be discussed by another member of this Association, I will not enter into details regarding it. Suffice it to say that when an exploratory incision reveals a large portion of diseased bone, and when it is impossible to remove the foci by erasion, resection should be immediately performed.

Enough has been said, in the earlier portion of this paper, to show that excision should not become a routine practice in bad cases of hip disease, as has become the practice of many surgeons in late years.

Excision is an operation of exceeding great value in well-selected cases, but it should be performed only with the full consideration of all the surroundings of the individual case. As to early excision, reasons for its avoidance have already been given.

As to the line of incision for excision, we may be governed by the location of the sinus, but we should be guided more by an avoidance of the muscular and nerve fibres than by any fixed line, although I prefer the curved incision passing behind the great trochanter from the posterior iliac spine. If the anterior incision is preferred, it may be commenced just below the anterior superior spinous process with the tensor vaginæ femori and gluteus on the outside and the sartorius and rectus on the inside, cutting directly down in front of the capsule.

It is well to save all healthy periosteum, but this membrane, when diseased, should be thoroughly removed, as should other disintegrated tissue. While excision should be thorough, it is not necessary that the trochanter, when healthy, should be sacrificed merely for the sake of drainage, as we can secure this by carrying a tube directly backward through the buttock, or in any convenient direction.

Retention of the trochanter will add greatly to the future useful-

ness of the limb, as well as in its length. A narrow saw, with a stout handle, similar to that of the Adams saw, but with a longer cutting blade, is usually more convenient than a chain saw. The soft parts can be protected from injury by retractors. For very deep work, where the chain saw is certain to break during an operation, I have had a chain saw made of the size and weight of an ordinary écraseur. This is much better fitted for heavy work, but is not equal to the straight saw.

When osteomyelitis is present in the head and shaft of the femur, care must be taken not to strip the periosteum from a larger area of the bone than is necessary in removal. When the disease extends far down the shaft of the femur, the foci can be removed by erasion, especially in cases where to clear away all disease would necessitate the removal of three or four inches. The result of entire removal in such a case would be to leave a "flail" limb, and amputation would be preferable save for appearance. It is best in these cases to perform erasion if a second operation becomes necessary.

The after-dressing which I find most convenient and comfortable, is simply light extension by adhesive strips with cord passing over a pulley, with heavy sand-bags applied to either side of the body from the axillæ to the feet. A wire cuirass is convenient and useful in cases where early transportation is required. The patient rarely suffers much pain.

In excision, as in erasion, all diseased tissue should be cut away and the acetabulum cleaned as freely as possible, the gouge and scoop being brought into use. Drainage should be thorough and complete, but the tube should not be retained any longer than is necessary to form a track for any deleterious material that may remain in the wound. Thorough antisepsis promotes rapid healing, but in excision, as in erasion, any remaining diseased foci will cause subsequent abscess.

When indications of commencing waxy changes make their appearance, excision is certainly desirable in order to check the drain upon the constitution, and with strong hope of arresting the disease. Sometimes, even when these changes are marked, although the immediate risks of the operation are great, yet life has been prolonged by the removal of the diseased foci.

I have recently seen a case where excision has been performed,

yet where suppuration has continued, and gouging had been practised three times upon the patient with the continuance of the suppuration after each operation. The kidneys, liver, and spleen showed most extensive changes, and yet the patient rapidly improved, gained flesh and strength and was nearly freed from the discharge of pus from at least a dozen sinuses by a three months' residence at the seashore. This case evidences the effect which the bodily constitution has upon the inroads of disease, when the system is placed under good resistive influences.

By rapidity of operation; incision of moderate length; sawing the bone with a narrow saw while in position and without much disturbance of the parts; by the prompt arrest of hemorrhage by the use of hemostatic forceps, and by extreme care in all the details of the operation, the shock is greatly diminished, and the seriousness of these operations has been greatly lessened in recent years. The condition of the patient has also been greatly benefited by the lessened drain upon his system through thorough antisepsis, and he is thus made better able to cope with the tendency to relapse. The necessity for excision, as for erasion, is greatly diminished by rest and fixation. After the operation no weight should be put upon the limb for many months, and the diseased region should be thoroughly protected from injury by some form of apparatus for at least a year after entire recovery has taken place.

Excision in the later stage will, unfortunately, yield from eight to ten per cent. of deaths within the first three weeks after operation, and fully three-fourths of the cases may be expected to relapse. In probably one-third of the cases improvement is favorable at the beginning, but the return of the disease in the next few months is to be confidently expected.

In cases of great deformity, with marked shortening of the limb, and strong adduction across its fellow, great gain in position may be secured by excision, although if these cases are progressing favorably, even they may be permitted to ankylose, when subsequent osteotomy will bring them into good position. In suppurative cases tubercular infection of the system is to be expected in from five to eight per cent. In non-suppurative cases the percentage is still less.

Croft puts the general mortality of hip disease at thirty and one-half per cent. Although one of the arguments in favor of early

excision is the prevention of tubercular infection, yet as eighteen or nineteen escape this danger in the ordinary course of the disease to one that becomes infected, this one does not justify the deforming results of early operation; especially if, as in the early stage, it is impossible to diagnose the exact number of foci of disease that are present, or that may exist in other portions of the body.

Wright acknowledges that only seventeen per cent. of cases of excision are satisfactory in their results; that twenty-five per cent. were absolute failures, and that nearly sixty per cent. were suppurating a year after operation.

In cases not operated upon, about one-half are suppurative, and fifty per cent. recover without loss of motion.

In eight hundred and thirty-seven cases of excision, ten per cent. of the deaths following operation were from rapid miliary tuberculosis.

In one hundred and forty-four cases Sack gives the death-rate as twenty; thirteen of which were from tuberculosis.

Grosch reports one hundred and sixty-six excisions with thirty-six per cent. of deaths, one-half of which were from tuberculosis.

Croft reports that thirty per cent. of deaths were from tuberculosis. Under antisepsis the death-rate has diminished after excision from thirty-three per cent. to fifteen per cent.

Marsh: In four hundred and one cases of hip diseases treated without operation, thirty-one per cent. died from suppuration. Of suppurative cases twelve per cent. were cured, and of non-suppurative cases sixty-nine per cent. were cured. Of non-suppurative cases ten per cent. died; eight per cent. recovered with useful limbs. Nine per cent of the deaths were from tuberculosis. Sixty-nine per cent. of cases suppurated, and of these thirty-three per cent. died without amputation having been performed. Of the non-suppurative cases only ten per cent. died.

The percentage of deaths in suppurative cases which occurred from albuminuria, waxy changes, and exhaustion, could probably have been saved by early excision.

Marsh: Of six hundred and fourteen cases treated by prolonged rest, the mortality was six per cent., but it is not proper that these cases, which probably were suppurative in a minor degree, should be compared with the twenty per cent. of deaths from excision, as

the circumstances of the class of cases were entirely different. In late excision ten per cent. died, and from twenty per cent. to thirty per cent. showed no improvement.

In the first stage the mortality is, as we know, from six to eight per cent. In the late stage, all suppurative cases with amyloid degeneration, the mortality rises from thirty per cent. to fifty per cent.

In thorough rest the mortality has been reduced in the Alexandra Hospital from thirty per cent. to five per cent. Seventy per cent. recover with slight loss of motion.

VIII. *Amputation.*—While amputation has been very serviceable in joints, aside from the hip, yet at this articulation, although sometimes employed, it is rarely of service, since cases necessitating so serious a loss of tissue would probably be accompanied with caries of the ilium, and the removal of the limb would be of only slight service, save in arresting the drain. It has, however, been occasionally performed, and when extensive osteomyelitis involving a large portion of the head of the femur is present, it would be decidedly preferable. Since Ferguson's advocacy of excision in 1850 amputation has decidedly (and properly) fallen into disuse since more conservative operation is usually of great benefit, and is less fatal.

As excision has lessened the number of amputations, so erasion will, in the future, lessen the number of excisions.

IX. *Osteotomy.*—As osteotomy is only to be practised after thorough consolidation of all the tissues, it need not be considered in the present discussion.

Conclusions.—1. Mechanical measures, which enforce strict and long-continued rest of the bone, are the best preventatives of operative procedures, and when they can be properly employed, as in private practice, operation is seldom necessary.

2. Antiseptic aspiration of the joint is desirable if it is distended with serum; sometimes when it is filled with pus.

3. Ignipuncture and trephining give great relief provided the focus of the disease is reached.

4. If in doubt as to the presence of pus, employ rest and fixation, and wait; or aspirate antiseptically. Repeat the aspirations if the fluid drawn is sero-purulent, or if the liquefaction of caseation is

present, since organization may occur without the opening of the abscess. If there are no signs of caseation, wait. If caseation takes place, make early exploratory incisions and remove.

5. When certain that true pus has formed, provided drainage alone is decided upon, aspirate and inject with iodoform, in order to strengthen the walls of the abscess cavity, as a preliminary to further operation.

6. If the abscess is to be opened and no further operation performed, incise freely, wash out the contents with a slow current of 1 : 2000 hot sublimate solution, but on no account employ pressure to expel the pus, lest fissures be produced in the internal wall and infection thus favored. Drain thoroughly, dress antiseptically, and fix the hip. Continue to keep it at rest until closure occurs, or until further steps are necessary.

7. When extirpation has been decided upon, make an exploratory incision either along the line of a sinus or directly upon the bone and thoroughly examine the joint.

8. If the destruction of tissue is small, try erasion and remove the carious bone and other tissues with scoop, scissors, and knife. Endeavor to remove every particle of tuberculous tissue of both hard and soft parts, including abscess and sinus walls. Irrigate thoroughly with strong antiseptics to prevent bacillary infection of the freshly cut tissues, and drain freely. Perform a formal excision when the disease is found too extensive to be removed in any other way. In desperate cases excision becomes of exceeding value, but should never be adopted as a routine practice. As erasion is less mutilatory than an excision, it should be performed provided all tubercular foci can be removed.

9. Always follow operative procedures by most careful attention to rest, fixation, and protection of the joint for months or even years.

EXCISION OF THE HIP-JOINT.

By REGINALD H. SAYRE, M.D.,
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In treating the subject of excision of the hip-joint the first question that presents itself is whether it is proper to excise this joint under any circumstances; and second, if it is a proper operation, at what time is it best done, and in what manner?

This question has been the subject of much discussion, and the opinion of the profession has at times run from one extreme to another. In 1854, when my father performed his first operation, he asked a number of the leading surgeons of New York to be present, and they all refused to lend countenance to such a foolhardy operation, except one gentleman, who begged not to be held responsible, as he had retired from active practice, and went out of curiosity to see a new thing.

From 1879, however, the German school rushed to the other extreme, and with the promulgation of the theory that those joint diseases which were formerly called scrofulous were, in reality, tubercular, and dependent on the bacillus tuberculosis, there arose the theory that all such joints should be excised as soon as discovered, lest the general system become infected, and also with the hope of reducing the duration of the disease from years to weeks. These happy results, however, were not realized. It was discovered that in a number of instances general tuberculosis set in soon after operative interference, and that many of those cases which healed by first intention suffered relapses, and a reaction has of late years set in toward more conservative methods.

In any operation we must base our proceedings on certain definite fixed principles, or principles which at least we believe to be fixed at the time we hold them, and, therefore, at the risk of repeating some

of the remarks that have been made by the gentlemen who preceded me, allow me to state my reasons for holding such views as I do in regard to excision of the hip.

I believe the ordinary cases of hip-joint disease are tubercular; that this tuberculosis is acquired, not inherited (although the weak constitution inherited from tubercular parents renders the patient less able to resist any disease); that some additional local influence, such as injury, is necessary to determine the part of the body which is attacked; and that, under appropriate mechanical treatment, commenced early in the disease, with good hygienic surroundings, nature in the vast majority of cases is able to effect a cure without excision of the joint. The inflamed area grows less, the tubercular mass becomes encapsulated and remains innocuous, or at any rate leaves the patient free from symptoms, or else after a time becomes caseous, liquefies, and is either absorbed, or, coming near the surface, is evacuated, the wound healing, and the patient's general health continuing good.

This being the case, I do not feel justified in cutting down and removing the heads of all femora which I believe to have in them tubercular foci.

These foci are commonly in the epiphyseal line, in the head of the femur, in very young children, and in the acetabular junction of the pubis, ilium, and ischium in older cases; and if they were so situated as to be easily removed without damage to the joint structure, and could be located before operation so that the entire area of disease could be removed with certainty, I should advocate such a proceeding.

The operations for removing these foci when lying in the femur by tunnelling the trochanter, as proposed by Macnamara and Greig Smith, do not come within the topic assigned to me, and their removal by excision of the femur certainly does not give so good results as mechanical treatment, either as regards the ultimate usefulness of the limb or mortality; and I therefore pass by excision in the onset of the disease.

If we, therefore, decide the question of immediate excision in the negative, and proceed to treat the patient mechanically, the question may arise later on whether the same method of treatment is to be pursued, or whether the joint had better be removed.

As I remarked before, the diseased focus may pursue two courses:

it may resolve altogether, or it may undergo caseation, and coming gradually to the surface may either open itself and discharge flakes of carious bone, or the surgeon may at such times interfere, opening the abscess and cleaning it out.

It is at this point that the question of excision is most unsettled. There are a number of surgeons who believe that when the disease has reached this point it is culpable negligence to delay excision any longer. Mr. Barker, for instance, says:[1]

"It is important to draw the clearest distinction between the liquefaction of caseation and true suppuration, not only as an abstract pathological axiom, but also for practical purposes. Of course, the necrotic changes and fatty degeneration which take place in a caseating nodule are as different from the exudative and proliferative processes at an inflamed and excited spot as death is from life. But the matter has its practical bearing on treatment. If a surgeon adopts the view that no operation is proper until suppuration has taken place in the tissues of a joint, he will always operate in very advanced disease. Tubercular affections are not associated with true suppuration, except at what may be called an advanced stage; so that, if the surgeon waits until it is present, much valuable time will have been irrevocably lost. But if the rule is made to operate as soon as there is evidence of the commencement of caseation, the conditions of operation are totally different.

"We shall be interfering, in such a case, relatively early and with all the consequent advantages. We must, therefore, in the future, watch for and endeavor to recognize early the doughiness of commencing caseation rather than wait for the distinct fluctuation of suppuration. Again, if the increased risk of generalization of the tubercular infection associated with the access of pyogenic organisms through the formation of sinuses be recognized, we shall be more careful to step in early, and before the latter have formed, will remove the whole of the locally infected tissues as thoroughly as possible, and secure union of the resulting wound by first intention."

Now, as a matter of fact, this caseation is often a final step in the natural history of the disease: the inflamed focus having been shut off from the surrounding tissues by thick protective walls, and

[1] British Medical Journal, June 16, 1888, p. 1263.

undergone fatty necrosis, gradually works its way to the surface, is discharged and the cavity heals, leaving only a scar behind to mark its previous existence; and I, therefore, believe those gentlemen who lay it down as a rule that all caseating hip-joint must be excised, are too hasty in their conclusions, and overlook the fact that in many of the cases the disease has passed its acute stage, and is on the high road toward recovery, which end it will reach if allowed to do so by the surgeon.

It is, however, unfortunately a fact that certain cases do not take the benign course I have sketched, but instead go steadily and progressively down hill, in spite of good hygienic surroundings and mechanical treatment, and irrespective of the abscesses being left to nature or being opened by the surgeon.

These are the cases where I believe excision is indicated, and indicated before the patient is exhausted and emaciated, and it is at this point in the disease that judgment must be exercised by the surgeon as to the time for interference.

There is no doubt that in the past much valuable time was lost while hesitating to excise, and there is no less doubt that with the present improved methods of wound treatment there has been a tendency to operate too early and too often.

I hope I shall not be misunderstood, and thought to be condemning excision of the hip. I merely wish to speak against rash interference, but in cases that have been treated properly from the beginning, and have steadily grown worse, and in those cases that when first seen are suffering from advanced hip-joint disease, I advocate excision.

In direct opposition to this view is the opinion of various surgeons amongst whom is Mr. Barker, who, while most strenuous in advocating excision as soon as caseation can be detected, says:[1]

"The practice of excising in advanced disease cannot be too strongly deprecated."

This I believe to be a mistake, for although the results of early operations are much more favorable than late ones, and though I do not advocate allowing the disease to run on till the patient is exhausted, still my father's list of excisions shows that in precisely

[1] British Medical Journal, June 16, 1888, p. 1264.

this class of patients, worn out by suppuration and with amyloid livers, recovery is even then possible after free removal of all diseased tissue, and some of his best results have been in the most unpromising cases which would certainly have died if left to nature.

In the operation of excision I believe that the utmost pains should be taken to remove all the diseased tissue, provided the patient is not too weak to endure a prolonged operation, and care should be taken to wound as few vessels as possible, and do the least possible damage to surrounding healthy structures, as the chances of general systemic infection are thus much lessened.

The last suggestion in the mode of operation comes from Mr. Barker,[1] who has made use of the incision first introduced by Hüter, and which runs from below the anterior superior spinous process of the ilium downward and inward for three or four inches, passing between the glutei and tensor vaginæ femoris on the outside and the sartorius and rectus on the inside. He then saws through the neck of the femur and removes the head of the bone, carefully scrapes the entire cavity, brushing it meanwhile with boiled water, dries it, washes it out with iodoform glycerin emulsion, and sews it up tight, having placed the end of the bone in the acetabulum and abducted the limb.

An elastic antiseptic dressing is placed outside and snugly bound down so as to prevent oozing, and the wound heals in a single dressing. At least this has been his experience in the three or four cases in which he has tried this plan, and is also confirmed by that of Mr. Bilton Pollard.

When these cases were shown at the Royal Medico-Chirurgical Society it was too soon to judge of the ultimate result, as all the patients were wearing splints except one, who had removed his contrary to orders, and had a marked limp and adduction.

In the healing of an excised hip in one week we have a beautiful example of the progress made in scientific surgery; and, in the hands of Mr. Barker and Mr. Pollard, this incision has been most satisfactory; but I judge it was because they operate earlier than I deem necessary, as, in most of the cases I have seen, I should have thought the complete removal of all diseased tissue in this manner a

[1] British Medical Journal, January 19, 1889, p. 121.

very difficult performance, and, unless it can all be removed and the incision tightly closed, I still believe a posterior incision more favorable.

I have never operated in this manner myself, but, in trying the operation on the cadaver, it did not seem so simple to me as the operation with posterior incision; and it seems probable from the numerous pathological specimens that have been reported, that the operation, if done as described, by cutting through the neck of the femur, may be very often followed by relapse, as there are quite frequently foci of disease in the trochanter, which would in this operation be left behind to set up further trouble. I, therefore, advise, as a general rule, section below the trochanter major made through a posterior incision, such as I shall presently describe. The incision should begin midway between the anterior superior spinous process of the ilium and the tip of the trochanter major, extending over the trochanter down the femur, curving slightly forward.

This incision should be made with a strong, heavy knife, and pass directly down to the bone, at the first cut dividing the periosteum. If the first incision does not completely divide the periosteum, a second or third should be made in the same line so as to do so completely. At the trochanter minor a blunt, curved bistory should be passed around the femur as far as possible, making a cut through the periosteum at right angles to the long axis of the femur, giving thus a T-shaped incision through the periosteum. The periosteum should now be carefully peeled off from the bone on both sides with a periosteal elevator, taking care to remove it as a shell, and not to tear it into shreds. When it is loosened as far as the digital fossa it will be necessary to use the knife again to sever the attachment of the obturator muscle. Care should be taken to keep as close to the bone as possible here, or an important arteriole may be injured, and give rise to troublesome hemorrhage, obscuring subsequent work.

The periosteum having been loosened, the bone should be severed just above the trochanter minor with a finger saw. This is better than using a chain saw, as the latter is almost certain to become fast.

The head and trochanter major can now be removed by a pair of heavy forceps. This mode of procedure is usually to be preferred to luxating the head of the bone, by adducting and flexing the thigh preparatory to sawing through the femur, as in cases where there is

as yet not much destruction of the joint the femur may be fractured in the effort to dislocate the head.

If the end of the femur does not look healthy the periosteum must be pushed down, and a second, or, if necessary, a third section made, until healthy bone is reached. The cuff of periosteum thus left is then to be split down to its junction with the bone. All diseased synovial membrane is now to be removed, and the acetabulum scraped if diseased. If there is necrosed bone here it must be removed, and if there is perforation of the acetabulum the edge must be chipped away down to the junction of internal periosteum with healthy bone, so as to leave no wall behind which discharges may lodge.

If the acetabulum is not perforated, but rectal exploration has shown intrapelvic bulging on the inner side of the acetabulum, the latter should be cut through, to allow free drainage from inside the pelvis.

There is little fear of wounding the peritoneum or intestines in cutting away the acetabulum; for, if there is disease so extensive as to require this measure, the periosteum on the inside of the pelvis will be so thickened as to form an effective barrier against danger.

It has been argued that it is unnecessary to remove the acetabulum down to the junction of bone and internal periosteum; but, in draining an abscess any proceeding which leaves a pocket behind is unsurgical, and I, therefore, wish to emphasize the danger of leaving a bony wall in front of the bulging periosteum in these cases. All old sinuses should now be either carefully scraped, or, if possible, dissected out.

The wound should then be carefully washed out with a slight amount of sublimate solution, 1 in 1000, and dried. It is well, if there is doubt that all diseased tissue has been removed, to wash the cavity with chloride of zinc solution, 40 grains to the ounce. The cavity is then to be packed with iodoform gauze from which the iodoform will not shake out. If the iodoform does not adhere to the gauze there is as much danger in using it as in sprinkling loose iodoform in the wound, and I have once had iodoform poisoning from packing a large wound with such gauze.

I believe this method of packing the wound is preferable to sewing it up tight or even with a drainage-tube; first, because it is not

certain that you have removed all diseased tissues, and the dividing line between bone which will live and that which will die is not clearly marked; and, second, because the limbs after this mode of treatment are less apt to have sinuses which continue for a long time, and give less shortening than when the method of immediate closure is adopted. If the end of the femur is pushed into the acetabulum, shortening to the amount of bone removed will result, or, if extension of the diseased limb is made without stuffing the hollow periosteum, the latter will collapse like an empty rubber tube, and give rise to loss of stability in the limb.

Some years ago the German surgeons found that about half of the cases that healed by first intention suffered relapses. Mr. Barker's cases of immediate closure have not been long enough under observation to decide this point as yet, but I hope his more thorough mode of operation will render his cases permanently cured.

In regard to the ultimate usefulness of the limb, I think the after-treatment of excision plays a very large part. As soon as the operation is finished the limb should be placed in the normal position and extended to the same length as its fellow, as far as possible. The joint should also be kept absolutely quiet. For this purpose I know of nothing so convenient as my father's wire cuirass. The patient is placed in this, and the body and sound limb fastened securely by bandages. The diseased limb is then fastened to a movable foot-board by means of adhesive strips extending from above the knee, and traction is made until the legs are of equal length, if possible, and kept at this same length until the wound has healed.

In the course of a few weeks, the patient can have a long splint applied and walk about on this, continuing its use for a number of months in most cases.

During the process of healing, gradual and increasing movements should be made in all directions with the diseased limb, to enlarge as much as possible the range of motion. And the weight should not be entirely borne on the diseased limb until the new joint is firm enough to support it without danger of the femur gliding up on the dorsum of the ilium.

In the records of my father's hip-joint excisions, published in

1883,[1] I find of those cases where the shortening was noted one with no shortening, twenty-nine with less than one inch, and fifteen with more than one inch shortening, two of these having between three and one having four inches shortening; while, as regards motion, four had perfect motion, six almost perfect, twenty-four good, fifteen moderate, and two were ankylosed.

I have not thought it worth while to quote statistics regarding various different modes of operating, as the conditions in different cases vary so widely that any comparison is useless, and the various tables that have been compiled with a view to showing the mortality after this operation are also very misleading.

Mr. Croft was very right when he protested against the mortality *after* this operation being called the mortality *due to* this operation,[2] as the very large majority of those who die after excision of the hip are those who would have certainly died if not operated upon, and a large proportion of the recoveries can also be placed in this same class, and to deny to these the benefit of excision is to deprive them of all chance of recovery.

[1] Sayre's Orthopedic Surgery, second edition.
[2] Clinical Society's Transactions, vol. xiii.

FIXATION AND TRACTION IN THE TREATMENT OF HIP DISEASE.

By JOHN RIDLON, M.D.,
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That there may be no question as to the principles which govern my treatment, let me state them before commencing with the discussion of the subject in hand.

I believe, then, that inflammation in and about the hip-joint should, in a general way, be governed by the same principles of treatment that govern the treatment of inflammation of like character affecting like tissues located elsewhere. I believe that physiological rest of the inflamed structures should be the chief end and aim of our treatment. By physiological rest, I mean relief from the performance of the normal functions. The functions of the hip-joint are motion and the sustaining of weight. Therefore, as applied to the hip-joint, rest is relief from motion and the sustaining of weight. Involuntary muscular spasm may give pressure in the same way as does superimposed weight. The problem, then, would seem to be, in so far as it is possible, to immobilize the joint so long as any inflammation remains; to remove the superincumbent weight until convalescence is well established; and to counteract the muscular spasm so long as that spasm is in any way harmful.

To immobilize the hip-joint, I have used plaster-of-Paris (applied from the ankle to the axilla on the affected side), weight and pulley after the manner of Howard Marsh, Thomas's splint, plaster-of-Paris applied to both legs from the feet to the axillæ, and the old Taylor hip-splint supplemented by my thoracic attachment. Bradford's frame, the wire cuirass, and Phelps's portable bed I have not used, as they do not seem to me to have, except under certain circum-

stances, any special advantage over the double plaster-splint and the double Thomas splint. As to which form of the above mentioned appliances to be chosen, the exigencies of the case and the materials at hand should decide.

To remove the superincumbent weight, I have placed the patient in the recumbent position (not, however, necessarily confining him to bed); on a high patten with axillary crutches; and on a long extension splint. The most effective is obviously the horizontal position; next to this stands the high patten (four to six inches) and crutches; while the most convenient is the long extension splint.

To counteract the involuntary muscular spasm, I have used traction by weight and by splint, both in the line of the axis of the shaft and of the neck of the femur, and I have used the various forms of immobilization above mentioned.

It is asserted on good authority that fixation alone will, and that fixation alone will not, relieve the muscular spasm; that fixation will, and fixation will not, induce ankylosis; that traction alone will, and that traction alone will not, relieve the muscular spasm; that traction will relieve the pain, and that traction will cause pain; that traction will certainly destroy the joint, and that without traction the joint will certainly be destroyed. That these opposing views can be held and practised by the most competent observers, and that, as it appears to me, they are in certain cases all well founded, shows how futile it is to pursue any routine treatment in every case of hip disease and expect to get the best possible results.

In considering the question from the standpoint assigned to me by our secretary, namely: Fixation and Traction, I would not be understood as discussing it in the sense of Fixation *versus* Traction, for under certain circumstances traction, inelastic and uninterrupted, becomes a part of fixation; but rather would I be understood as discussing it in the sense of Fixation *versus* the Portative Traction Hip-splint when used during locomotion.

Traction with the patient recumbent had been used for a very long time before the idea of portative traction was conceived; it has been, since that time, in constant use by those who scouted the idea of portative traction, and looked upon "motion without friction" as a mechanical absurdity. Traction with the patient recumbent is still used by the majority of the profession, and in certain stages of

certain cases it does undoubtedly serve a most useful purpose in relieving pain due to involuntary muscular spasm. But the traction must be constant and uninterrupted, and in the line of the deformity; it must be combined with apparatus which prevents voluntary movements at the joint, and with the patient recumbent in bed, on a portable bed, frame, stretcher-bed, or some similar device. Traction thus applied is quite a different thing from traction applied by a portative traction splint while the patient is permitted to walk about. When a patient wearing the portative traction splint in walking lifts the affected leg, traction is made upon that leg to the extent of from five to eight pounds, plus the weight of the splint, some five to seven pounds more; when the weight is borne upon the splint, in the process of lifting the well leg, no traction whatever is exerted and the femur is forced upward by the involuntary spasm of the muscles, so long as the spasm remains present. Moreover, as that muscular spasm is the first symptom to appear, and the last to disappear, it should be evident that, in walking with the portative traction splint applied, the diseased head of the femur is pushed into the diseased acetabulum, and then pulled out again, three thousand times an hour during all the long hours of the day, of the months and years of this most protracted disease.

The portative traction hip-splint was devised by one who believed that motion at the joint was desirable, and when used to exert traction during locomotion there can be no doubt that it does increase the vertical motion, even beyond that obtainable in a healthy joint. But with the question of motion in the treatment of hip disease I have nothing to do—that has been assigned to another. Only, in passing, I desire to call your attention to the fact that although the advocates of "motion without friction" obtained by the use of the "portative traction hip-splint" have been with us for over thirty years they have not published the results of their treatment. Until they do this a serious discussion of the value of motion does not seem to be called for.

As to the importance of removing the superincumbent weight from the diseased member I think we are all agreed, although we may differ as to how it should be accomplished. The only point of interest would seem to be as to when a patient should, and when he should not, be confined to the recumbent posture. My own belief

is that so long as the general health remains good, so long as pain continues, and so long as voluntary muscular spasm is increased by locomotion, the patient shall be confined to the horizontal position. I admit that it is more important to save life than to give a perfect leg, but I must ask you also to admit that it is better to gain a perfect leg than to give pleasure to a child.

The subject, then, is narrowed down to fixation and traction. If traction is to be used at all it should be constant and uninterrupted, and in one and the same line. Traction at a right line at one time and at a right angle at another, as is permitted by most forms of traction apparatus, cannot be free from harm; and the push-and-pull action of all traction hip-splints during locomotion must be seriously condemned. Splints, to be sure, have been devised to the end of eliminating this pumping action at the joint, but since they are neither used by their authors nor by any one else their merit does not call for consideration.

As to the value of fixation we are pretty nearly a unit. The old "American method" of motion without friction has passed away—*requiescat in pace*—and a new American school has arisen. We are members of that school. We believe in fixation, first, last, and all the time. We believe in traction, too, while there is pain from involuntary muscular spasm—traction with the patient in the recumbent position—traction, constant and uninterrupted. But, traction during locomotion, as given by the traction hip-splint? That is a question that will bear some further discussion.

An inquiry into the results of any plan of treatment should, at the least, consider:

The mortality.

The duration of treatment.

The general health during treatment. And bearing directly upon this, the length of time patients are confined to bed in-doors.

The frequency of abscesses which go on to operative interference or spontaneous opening.

The ultimate condition of the limb as to usefulness.

The amount of actual shortening, *i. e.*, shortening due to erosion, displacement, and arrest of growth.

The amount of apparent shortening, *i. e.*, the actual shortening plus the shortening dependent upon flexion and adduction.

And, finally, the degree of motion at the joint.

To get a standard by which to measure the results of mechanical treatment let us take the cases reported by Dr. V. P. Gibney (*Med. Record*, March 2, 1878, p. 174), that had been under observation at the Hospital for Ruptured and Crippled, but had had no treatment by operation or mechanical appliance. Of 288 cases $4\frac{1}{2}$ per cent. died from exhaustion; $4\frac{1}{2}$ per cent. from amyloid degeneration; $1\frac{3}{4}$ per cent. from tubercular meningitis; $1\frac{3}{4}$ per cent. from other diseases. Out of 80 cured cases, in 23 the disease ran its course in 3 years; in 28 it ran its course in 3 to 6 years; in 16, 6 to 10 years; in 1 it ran its course in 15 years. 69 were in good general condition, and 11 in fair general condition, during the course of the disease. The time spent in bed is not stated, but it may be assumed that when the pain was severe, and the joint-tenderness great, they remained in bed, and at other times were allowed to go about. 48 had abscesses which, presumably, went on to simple puncture or spontaneous rupture; 31 had no abscesses. 61 could walk and run well without discomfort, although there might be a marked limp; 12 could walk short distances without assistance, but in walking long distances a stick, and sometimes a crutch, was required; 7 could not walk well without the aid of a high shoe or crutch. As to shortening (not stated as to whether apparent or actual), 1 had none; 2 had $\frac{1}{2}$ inch; 24 had 1 inch; 17 had $1\frac{1}{2}$ inches; 19 had 2 inches; 7 had $2\frac{1}{2}$ inches; 7 had 3 inches; 2 had 4 inches. As to flexion: In 2 the thigh was flexed to 90 deg. with the body; in 3 to 110 deg.; in 3 to 120 deg.; in 19 to 135 deg., which militated but little against good locomotion; in 19 to 145 deg.; in 18 to 150 deg.; in 11 to 160–170 deg.; in 4 no estimate was made. The degree of adduction is not stated. As to motion: 2 (at least) had ankylosis: and 12 had motion from 15 to 90 deg.

M. Cazin, in a paper on the benefit of residence at the sea-side, read before the Société de Chirurgie (*Med. Times and Gaz.*, May 20, 1876), reports on 212 cases taken from the most unfavorable class of these cases to be found in the Paris hospitals. Eighty of these cases were in a state of suppuration. No surgical operation was performed, the treatment consisting only in keeping the limb immobilized by means of a silicate bandage or modification of Bonnet's splint. The results in the non-suppurating cases are not given; of

the 80 suppurating cases 54 were cured, 6 improved, 20 were considered incurable, and 10 died. In 5 of the 10 fatal cases albuminuria existed on admission, the others dying from pulmonary phthisis, or from exhaustion produced by long suppuration.

Reliable statistics of any considerable number of cases treated by immobilization are wanting. Although Thomas's splint has now for some time been in pretty general use in England, but few patients have been treated by others than himself in a satisfactory way. Mr. Thomas's own cases have been in private practice, and records have been kept only of those showing some special point of interest. The records of his cases, to which I have access, give the time in bed from 9 to 52 weeks, the average being 22 weeks; the duration of treatment from 12 to 36 months, the average being 21 months. Abscesses are not infrequent, but I have no data on that point. He claims that all cases that recover do so without flexion and without adduction. Shortening is present when there has been erosion, and when the growth of the limb has been arrested by the disease. Ankylosis is only found when the inflammatory process has been exceptionally destructive. No one any longer claims that the prolonged immobility to which he subjects his patients is, in itself, productive of ankylosis.

In order to show the results of prolonged immobilization in suppurative cases, Mr. Robert Jones exhibited upward of 20 patients before the Liverpool Medical Institute (*Liverpool Medico-Chirurgical Journal*, July, 1888). Among these 9 had suffered from disease at the hip-joint. They were as follows:

Case III.—Suppurative arthritis of hip; amyloid disease. C. B., æt twelve. Duration nine years; splint for eight years, without interruption; aspiration thirty-five times; six sinuses into the joint; half an inch shortening; very good motion in the joint.

Case VI.—Suppurative arthritis of hip, with fifteen sinuses leading into the joint; kidneys diseased for two years; hyperpyrexia for three years, at short intervals; in splint for ten years; patient twenty-five years old; can walk six miles without being very tired; no deformity; shortening three-quarters inch.

Case IX.—Suppurative arthritis of hip, with lordosis and tilted pelvis; eighteen months under treatment; two incisions made; cor-

rection of deformity; shortening scarcely half an inch, although apparent shortening when first seen was three inches.

Case X.—Arthritis of hip; splint taken off at meeting for first time after four years' uninterrupted confinement, to show that long-continued rest did not result in ankylosis; motion free.

Case XI.—Suppurative arthritis of hip; three abscesses into the joint, lardaceous disease, and dropsy for twelve months; complete recovery with three-fourths of an inch shortening.

Case XIII.—Suppurative hip disease in a baby cured after eighteen months' treatment, where only one aspiration proved necessary.

Case XV.—Suppurative arthritis of hip; six sinuses; duration of disease six years; four years in splint; albuminuria sixteen months; three-fourths of an inch shortening; movement increasing.

Case XVIII.—Hip disease of seven years' standing in youth of seventeen. Two sinuses into joint; five years in splint; moderate motion, which is increasing; no deformity.

Case XX.—Suppurative hip-joint; disease of seven months' duration in boy of ten; good recovery with motion.

Dr. A. B. Judson (*Illustrated Medicine and Surgery*, April, 1882, p. 45) recorded the results of the use of the Taylor splint in three similar cases. They were, in brief, as follows:

Case I.—Nine abscesses; at times during the treatment the health was bad; recovery; no adduction; slight flexion; one inch shortening; under treatment two years and five months. Useful limb resulted. Motion not stated, but ankylosis inferred.

Case II.—Six abscesses; general health at times bad; treated two years and seven months; result, useful limb; no adduction; moderate degree of flexion; one-fourth of an inch shortening.

Case III.—For many weeks constitutional disturbance was severe. Treatment consisted in the addition of axillary crutches to the Taylor splint for one year, then jointed splint without axillary crutches for three years. Result, useful limb; no adduction; motion practically abolished; moderate degree of flexion; one-half inch shortening.

These results are remarkably good. And although there remained slight flexion in all, the results compare very favorably with Dr. Jones's cases.

Continuing a study of the results of the long traction-splint, we may next consider Dr. Charles Fayette Taylor's cases. In the *Boston Medical and Surgical Journal*, March 6, 1879, p. 324, the

results are given of ninety-four private cases of hip disease which were under personal observation and continuous treatment from the time they applied until they died or were cured, and whose present condition is now, or was very recently, a matter of personal knowledge. Of the ninety-four cases, three died—two of the disease, and one was run over and killed. There were twenty-four with suppurating joints and discharging abscesses—nearly all in that condition when first applying. Of twenty-four with abscesses, two died, the same as above stated, and in five the discharge has not yet ceased. Deducting these seven, there remain seventeen fully recovered, or seventy per cent. of the suppurating cases. Three of the seventeen recovered cases have ankylosis, and fourteen recovered with practicable joints, the majority with ample and some with perfect motion.

It seems hardly fair to compare this class of cases, who were able to have every advantage that can accrue to private patients of a wealthy class, with the dispensary poor reported on by Dr. Gibney. Still, the comparison has some value.

Of an exactly similar class to Dr. Gibney's cases, are those treated at the New York Orthopedic Dispensary. From 1877 to 1887 (according to the annual reports) 1355 cases of hip disease were under treatment: 223 died; 367 were discharged cured; and 640 were otherwise discharged. For the other points of interest, we have only a report from January 1, 1875, to December 31, 1882 (Newton M. Shaffer and Robert W. Lovett, on the Ultimate Results of the Mechanical Treatment of Hip-joint Disease, *New York Medical Journal*, May 21, 1887). During this period of seven years, 908 cases (according to the annual reports) were treated, and 168 were discharged cured.[1]

When in the spring of 1886 the authors undertook personally to investigate and carefully record the ultimate results of these cases, but 51 could be traced. Of these 4 had died, and 6 had relapsed.[2] 2 more cases were not seen and examined, but were reported to be in excellent health and doing well. Of the remaining 39 cases,

[1] This number, 168, is taken from the paper of Drs. Shaffer and Lovett. The annual reports do not give the number cured during 1875 and 1876, nor from October 1st to December 31st, 1882.

[2] Two more cases, that were reported among the cured relapsed and came under the writer's observation between the time of the completion of the statistics by Dr. Lovett and the reading of the paper by Dr. Shaffer.

4 were under treatment two years; 4 two and a half years; 9 three years; 6 three and a half years; 8 four years; 2 four and a half years; 2 five years; 1 six years; 1 six and a half years; 1 seven years; 1 eight years: an average of forty-four and one-half months.

The condition of the general health during treatment was not stated; nor the length of time that each case was kept in bed. From personal knowledge, however, I may say that when a patient presented deformity of such a degree as to render walking difficult, or when the joint was so sensitive as to render walking painful, he was put in bed at home and visited by the out-door visiting surgeon as often as seemed necessary, or he was placed in a bed in the hospital ward of the institution, or at St. Luke's Hospital, until the deformity was reduced and the painful condition subsided. During my term of service as out-door visiting surgeon (October 15, 1884, to October 20, 1887). I treated in bed, at their homes, 161 patients of the institution suffering with hip disease. The average time that these cases were kept in bed was eleven weeks and five days. Of the patients suffering from hip disease at St. Luke's Hospital (generally more severe cases than those treated at home), during the same period there were 57, and the average time in bed was seventeen weeks and six days.

Of the 39 cases, 27 had abscesses, and 12 had none.

As to the ultimate usefulness of the limb: All were at their work and none with evidence of tubercular disease or serious incapacity arising from the condition for which they had been treated.

As to shortening: 2 had none; 2 had one-half inch; 10 had 1 inch; 7 had one and a half inches; 9 had two inches; 5 had two and a half inches; 1 had three inches; 1 had six inches: a total of 37 (this leaves two not reported).

The case having six inches shortening had dislocation of the head of the femur, but had no other evidences of suppuration.

15 cases had no flexion. In other cases the thigh was flexed at an angle of 120 to 135 deg. with the horizontal plane of the body. It is proper to state here, however, that flexion at 135 deg. by Dr. Shaffer's method of measurement usually becomes flexion to a right angle (90 deg.) by Thomas's method. This I have demonstrated in a large number of cases.

As to adduction, but 24 cases are reported upon: In 13 it was

slight or absent; in 8 it equalled 10 to 15 deg.; and in 3 it was about 30 deg. In 1 case with slight flexion, but with adduction to 30 deg., a real shortening of one and one-half inches became, for practical purposes of locomotion, a shortening of four inches.

As to motion: 3 cases had perfectly free motion; 3 had 90 deg. motion; 7 had 10 to 45 deg. motion; 6 had slight motion; 16 had no motion: a total of 35 (this leaves four not accounted for).

But one case is reported with superextension at the knee, and none with in-knee resulting from stretched ligaments, both conditions which I have frequently found in patients treated with the long traction-splint. Pain and weakness at the ankle on the affected side was common, and inability to flex the foot beyond a right angle was present in 20 cases, absent in 13, and the rest were not noted.

To recapitulate: Out of over nine hundred cases treated up to December 31, 1882, it was possible on May 21, 1887, to report among the cured, but two with no shortening and but three with free motion at the joint; but fifteen with no flexion; and but thirteen in which adduction was slight or absent.

It has been my fortune to treat, or share in the treatment of, upward of 1100[1] cases of hip disease with the long traction hip-splint, and the convictions which I am about to express are founded upon a study of those cases, taken together with the statistics above quoted, and others bearing in the same direction.

In conclusion, then, I would say that it does not appear to me that sufficient evidence has been presented to demonstrate that the results of the use of the traction hip-splint are any better than, or as good as, those obtained by any purely fixative apparatus: nor does it appear that the results are any better than those where the "expectant treatment," or no treatment has been employed; nor

[1] These comprise cases from the New York Orthopedic Dispensary during a service of nearly seven years as Assistant, Senior Assistant, and Out-door Visiting Surgeon; from St. Luke's Hospital during a service of nearly eight years as Assistant, and Attending Orthopedic Surgeon; from the Dispensary and Clinic of the Medical Department of the University of the City of New York as Attending Surgeon and Instructor in Orthopedic Surgery during a period of five years; from the Department for the Out-door Poor, at Bellevue Hospital, during a service of two years as Attending Surgeon to the First Orthopedic Division; from the Vanderbilt Clinic during a service of nine months as Assistant Surgeon; from the private practice of Drs. N. M. Shaffer, S. Ketch, T. L. Stedman, L. W. Hubbard, R. P. O'Neill, Wm. H. Sherman, R. F. Burke, Thomas Kelly, and my own private practice.

has it been shown that the use of the traction-splint shortens the disease. On the other hand, the statistics quoted have shown that it does *not* prevent actual shortening from arrested growth, from erosion of bone, and from subluxation; that it does *not* prevent apparent shortening from flexion and adduction; and that it does *not* prevent stiffness at the joint. It has also been shown to cause in-knee, and superextension at the knee, by stretching the ligaments, and weakness and talipes equinus at the ankle.

The most often repeated, if not the only charges made by the tractionists against pure fixation (without traction) is that it does not so quickly relieve the pain (a point yet to be proven), and that it favors actual shortening from erosion of bone. The claim that pure fixation removes apparent shortening by preventing flexion and adduction they do not object to. And the claim that fixation does not induce ankylosis in a tubercular joint is no longer questioned.

Routine treatment of any kind should be condemned, whether it be of traction or fixation, or of simply making the leg a pendant member, or of waiting for Nature's cure. Each case should be treated on its merits; and its indications should be followed in so far as the surrounding circumstances and the means at hand will permit. As Dr. Charles Fayette Taylor once so aptly said: "It is absurd to speak of an instrument for hip disease. There can be no one complete instrument for hip disease."

THE AFTER-TREATMENT OF HIP DISEASE.

By A. B. JUDSON, M.D.,
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The removal of the splint is a very interesting and practical subject for consideration. Imperfect knowledge of the existing morbid anatomy, troublesome at all stages, especially baffles our judgment in convalescence. It is, of course, better to wear the splint six months too long than to take it off a week too soon. As it interferes but little with the patient's ability or convenience, no harm is done by wearing it for several months unnecessarily.

It is a good rule to remove the splint gradually, consulting not only objective signs but also the patient's wishes to a certain extent. Traction and adhesive plaster, at first agreeable because they stay the limb, after a time when disturbance of the joint is tolerated become irksome. When we see that the key is seldom used with effect, notwithstanding our instructions, we may proceed with deliberation and judgment to withdraw this part of the apparatus, relying on the ischiatic crutch for the remaining months and years—generally years—of treatment. When, later in the history of the case, all symptoms have been absent for a year, we may very gradually withdraw the ischiatic crutch, allowing freedom from it first for a few minutes at the morning and night toilet, and later for a portion of the day in the house, and later still for all the time when the patient is in the house, and afterward for limited excursions out of doors. Thereafter the splint is to be worn only when unusually long excursions are to be made, and finally it may be dropped altogether.

This gradual process should cover several months, during which we may watch for any indications of the necessity of retracing our steps in whole or in part. The great majority of patients remain

permanently well. There are exceptional cases, which mean recurrence or perhaps mistaken judgment at the time of suspending treatment. In such cases treatment should be resumed with as much earnestness and confidence as if the disease were beginning.

In regard to the increase of deformity after the patient has recovered I think it happens in a number of cases, leading to the wish that the ankylosis of hip disease were bony instead of fibrous. Referring to the views expressed in another paper read by me at this meeting of the Association, I think the means recommended for the attainment of a good position during treatment should be kept in mind and observed through life; that is to say, the patient, after as well as before recovery, should persevere in observing a naturally rhythmical gait, thus dividing the work of locomotion equally between the two limbs. In this way the impaired limb will be kept in a good position in order to enable it to meet the requirements made of it.

I am inclined to doubt the permanent efficacy of operations on the femur for the correction of any except the most extreme and indurated deformities. The angle established in the bone by operation is, of course, permanent; but I should fear that abduction and flexion would recur at the point of fibrous ankylosis unless the patient were led to assume a manner of walking in which the well limb, always enormously developed, would not monopolize the labor of progression. In favorable cases a combination of these two methods ought to be eminently successful.

THE PREVENTION OF THE SHORT LEG OF HIP DISEASE.

By A. B. JUDSON, M.D.,
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A SHORT leg is what is commonly dreaded as the result of hip disease. The shortening is not, however, as a rule, due to shortening of the bones. What produces the short leg of hip disease is an immobilization of the joint which prevents the reduction of flexion of the thigh or adduction of the thigh, or which, as too often happens, prevents the reduction of both flexion and adduction. If, for instance, the patient stands with the thigh considerably adducted, we will say 22.5°, and fixed at that angle, the limb cannot be made vertical without elevation of that side of the pelvis, with of course a drawing up of the heel and an inevitable appearance of shortening. And if the thigh is flexed, for example 45°, and fixed at that angle the limb cannot be made vertical without an inclination forward, which gives an appearance of shortening to the whole figure. Thus we see that when the patient stands, adduction means "apparent shortening." The same is true of flexion. And when we direct our attention to the deformity which attends the patient when he walks, we see that the affected side dips at every step, and that when the limb comes into a vertical position, as it does at the critical moment when it is called upon to support the weight of the body, the pelvis rocks forward or laterally, or it may be in both directions at every step; and we have the characteristic gait of hip disease.

If on the other hand the thigh is immovable on the pelvis in a good position, neither adducted nor flexed, when the patient stands the limb is vertical and the pelvis is level in all directions; and when the patient walks, the pelvis without any lateral tilting rocks to and fro with a moderate motion, enough to allow the limb to swing back-

ward and forward by virtue of the mobility of the vertebral joints and the hip-joint of the unaffected side in the arc appropriate for locomotion in a comparatively easy and graceful way. Walking thus performed is attended with no dipping of the affected side, and with no shortening except what may come from shortening of the bones or "real shortening."

How to secure a good position of the limb in the hip-joint ankylosed by disease, is a question of great importance, second only to the question, How can we promote resolution of the inflammation? I believe a good ultimate position of the limb can be best sought by inducing the patient to use the affected limb as much as possible in walking of course, protected from concussion by the hip crutch.

I do not mean to say that traction is useless as an agent for overcoming deformity: it will diminish extreme deformity with absolute certainty, whether applied with the weight and pulley or the rack and pinion; but it is less effective when the angle of deformity is only moderate or slight. Applied, for instance, to an extreme case of flexion, it will produce extension. Indeed, traction, a few years ago, was universally called extension. But in proportion as flexion is reduced, the power of traction further to reduce the deformity rapidly diminishes, because it is evident that a given power loses its ability to overcome resistance at the angle as the angle becomes more obtuse.

If, for instance, we would straighten a crooked nail, we may, if the nail is very much bent, say at an angle of 90°, reduce the angle by traction; but as the angle becomes more and more obtuse, the power of traction to accomplish our object lessens, and finally disappears.

This consideration is one of those which lead me to discredit traction as a means of reducing deformity. Another is the fact that, although traction may, in skilful hands, overcome even slight degrees of deformity, it is only by assiduous attention and a nice adjustment of the direction in which the force is applied that this may be done. The corrected position of the limb thus brought about is maintained while the patient is under special supervision and restraint; but when they are relaxed, the causes, whatever they may be, which produce the deviation resume their influence. And this leads to the

inquiry, What are the causes which produce the customary deformity of hip disease? In other words, what flexes and adducts the limb?

This question is quite distinct from the question, What prevents motion? We know that motion is prevented, first, by reflex contraction of the muscles, and afterward by ankylosis; but what determines the position of the limb through the months and years when muscular action holds it fixed; what forbids a good position and inclines toward adduction and flexion? If one can discover the forces which cause the limb to err, we may perhaps remove or thwart them.

It has been said that effusion determines the direction of the limb, which takes that position in which the capsule can best accommodate the volume of fluid. Migration of the acetabulum and dislocation of the femoral head have also been cited as controlling forces. Abduction has been thought to depend on spasm of the gluteal muscles, followed by their paralysis, which allows their opposing muscles to produce adduction. Atrophy and attrition of the head and acetabulum have been thought to have some effect in deciding the character of the deformity. It has also been said that the limb takes that position in which an imaginary painful spot or area on the head of the femur is furthest removed from the depth of the acetabulum, where it would receive pressure from muscular action.

In some stages, and in certain cases, each of these modes of accounting for the chosen position of the limb may or may not be correct; but what we want is to recognize some cause, general in its application, and independent of such pathological conditions as have been cited, which are more or less transient and difficult to demonstrate in bone, muscle, nerve, or effused fluid. A more widely applicable theory is that which says the position is generally the attitude of minimum suffering; but pain is not always present—indeed, as a rule, it is present but a small portion of the time during which the limb is held in its selected position. Can we not find a cause which is in force in all periods of the affection, the painless as well as the painful?

It has been said, and wisely, that the position is due to the efforts made by the child and nature to secure fixation, and that the position assumed is that in which the immobilization of nature reaches its maximum. This is a good explanation, and is applicable to every

case in all its stages; but I do not think these words quite cover the whole ground. I would add to them a line recognizing the influence exerted on the direction of the limb by the patient's habitual attitudes and movements.

Before accepting this addition, however, it will be necessary for us to accustom ourselves to recognize the fact that the fixation or immobilization created by reflex muscular action is very far from being absolute immobility—a view which is in accord with the ordinary events of practice. Cases in which fixedness is inconstant are matters of daily observation. For instance, a joint at the first moment of examination is without motion, but a few moments of delay and skilful manipulation reveal motion. Or, at one examination, the limb is in a position—adduction, we will say—at a certain angle, which is made a matter of record, and at the next examination, a few hours or days later, the angle is widely increased or diminished. Or, a patient with marked deformity is put to bed with a weight and pulley, or is treated by traction with the hip splint, and the deformity is greatly mitigated in a few hours. In all these cases reflex muscular action is in force, and yet it does not prohibit changes in the direction of the limb. The condition resembles that found in patients affected with a certain kind of paralysis, whose joints have been compared to a leaden pipe which retains its shape with a very positive degree of fixedness, but which can be bent by the application of a suitable degree of force.

In view of this mobility of the joint, fixed by reflex muscular action, I believe that the position assumed by the limb is dictated by the patient's efforts, both voluntary and reflex, to place the limb where its fixation will be liable to the least disturbance, and where it will afford him the most convenience in his ordinary attitudes and movements.

Before considering how to avert deformity, it is in order first to review the typical positions of the limb in hip disease. They seem to be three in number, and arranged chronologically as follows: (1) Abduction, which is produced early in the disease, when the patient seeks to favor the limb when he stands by putting his weight on the sound limb. He assumes the attitude which follows the military order "at rest," in which the limb is abducted, with a descent of the pelvis on that side, and apparent lengthening. Later in the

progress of the disease we have, (2) Adduction and flexion, caused by the patient's efforts to withdraw the affected limb from undue contact with the ground, and to make the disabled member as little an impediment as possible, while the chief work of progression is done by the sound limb. The natural rhythm of the gait is broken, the sound foot being on the ground longer than the other, and the affected limb is drawn up out of the way, when the foot is raised from the ground by an elevation of the pelvis on that side, with, of course, adduction and flexion of the thigh, and apparent shortening. Finally, in the neglected and bed-ridden patient we have, (3) Extreme flexion of the knee and thigh, and extreme adduction of the thigh, obviously the position in which the patient is most comfortable and the joint most free from disturbance.

These changes, taking place in a typical and uninterrupted case, but illustrate the mobility of the immobilization, so to speak, which characterizes hip disease. In passing, would it not be well to agree to call this form of immobilization "fixation," a term the status of which is not yet established, leaving the longer word to be applied to absolute immobility, such as accompanies ankylosis or bony union after fracture? We could also use the term fixation to indicate what we produce in the hip-joint by traction, which is not absolute immobility, but enough of immobilization to aid the natural efforts to keep the joint still and promote resolution, and yet not enough to stand in the way of desirable changes in the position of the limb.

To return to methods of averting deformity, the first position, that of abduction, seldom calls for attention in practice. It would in some cases be fortunate if slight abduction could be maintained as the ultimate position, because the apparent lengthening thus secured might happily compensate for whatever real shortening is entailed by the destruction or retarded growth of the bone. The third position, extreme flexion and adduction, cannot occur with the use of the hip-splint; and as we all, I presume, adhere to treatment by this apparatus, the practical question before us concerns only the prevention of the second position—that in which the thigh is seriously but not extremely flexed and adducted. How can we, then, by the use of the hip splint, keep the limb slightly flexed, and neither adducted nor abducted during the many months which usually inter-

vene between the first appearance of this position and the occurrence of ankylosis?

To recall what we have said about the cause of this deformity, it is the result of the patient's efforts to keep the affected limb off the ground while the well limb does most of the work of progression. If, then, we can induce the patient to adopt a gait in which the two limbs are used equally, the cause of the deformity would vanish. The affected limb would then reach for the ground at every step when its turn came, and that would mean a descent of the pelvis and the abolition of adduction, and this would be unattended with violence to the affected joint, because the weight of the body comes on the ischiatic tuberosity resting on the perineal strap, and not on the heel. The first, or an occasional effort of this kind, would not be likely to produce any effect, but if the effort is made habitual, or a matter of systematic drill, the adduction of the limb will be gently and gradually corrected, because the patient, consciously or otherwise, will incline the limb toward abduction, so that he can more readily conform to the mode of walking prescribed for him. Undue flexion is subject to similar corrective procedures. And if the naturally rhythmical action of the limbs is restored and becomes habitual, the limb, fixed in a good position by reflex muscular action, becomes immobilized by ankylosis, and the patient recovers with the minimum of deformity and locomotor disability.

It may be said, by the way, that the rhythm of the human gait is a subject which has not perhaps received the attention to which it is entitled. When natural, it is very simple—the time being divided equally between the two feet; but its very simplicity makes a slight deviation very noticeable, as in the lameness of incipient hip disease in a child, in whom the ordinary motions of the joint are as yet unlimited, and where lameness is entirely due to the fact that he violates rhythm by spending more time on the sound than on the affected limb. He accents the blow given to the ground by the well foot, which hastens to relieve the affected limb of the weight of the body. It is a point of practical importance that many people who are lame add to their lameness by neglecting to keep correct time with their feet. Any of us can appear lame by simply giving more time to one foot than the other, a matter of easy and immediate demonstration; and one

who is really lame can lessen the appearance of being so by simply giving natural rhythm to the action of the feet.

I have been led to the opinions[1] presented in this paper by pondering the question, Why do patients similarly affected, and treated exactly alike, recover with such different degrees of deformity? A young girl, for instance, was in the third stage, in which she nearly lost her life, before treatment was begun. She has recovered with no adduction and almost no flexion; so that although there is real shortening of nearly two inches, there is very little lameness. I attribute this good position to the fact that her mother was very anxious about her only daughter, and was always with her, so that every step the child took with the hip-splint was taken under the necessity of appearing as well as she could. Her steps were of equal length, and the affected limb become ankylosed in a useful position because it had to do, as far as was possible, half of the work of locomotion. I also treated a boy who recovered from the disease in a more moderate, although purulent, form; but he limps about most awkwardly with 20° of adduction, and 50° of flexion. I explain his bad position by the fact that his mother, one of the best of women, was busy out of the house every day, and nearly all day, necessarily leaving at home, and very much to their own devices, her family of four boys. As the patient was most of the time in excellent general health and very ambitious, he vied with his brothers in all their games, and developed his well limb enormously at the expense of the affected one, which was elevated and adducted to keep it out of the way. In another case, the patient, who recovered after long-continued purulent discharges, was a girl endowed with uncommon beauty; and although she was by no means docile, and under very little restraint at home, her vanity led her to try always to appear to the best advantage, and thanks to her careful gait and studied attempts to be graceful, she now walks with very little lameness, with flexion not more than 10°, adduction *nil*, and more than two inches of real shortening.

Another child whose treatment as a hospital out-patient was finally suspended on account of neglect, will probably recover with the limb

[1] Medical Record, May 21, 1887, p. 586. St. Louis Courier of Medicine, May, 1881, p. 372.

adducted 45°. A year before her final discharge she was made an in-patient and the deformity was entirely reduced by recumbency and the weight and pulley for seven weeks, but soon after returning to her home, where poverty and a large family make ordinary parental care impossible, the deformity recurred and will doubtless be confirmed.

These are the more striking examples selected from many cases the study of which has led me to the practical conclusions above expressed. I believe that for years I made a mistake by encouraging patients, protected by the hip-splint, to take part in the usual occupations of healthy children. One result was frequent chafing by the perineal straps, which at once destroys correct rhythm, because it is impossible for the patient to divide his weight equally between the well foot on one side, and the excoriated perineum on the other. It is my practice now to advise moderation in exercise, and especial attention to the manner of walking. I insist on the patient's keeping time in his steps so far as practicable, and lead him to adopt and maintain a proud bearing, keeping his head high and behind the vertical of the centre of gravity. A girl is told to practise deportment before the looking-glass, and a boy is advised to organize a juvenile military company, and to take command of it himself. The parents are informed of the importance of encouraging the child to adopt deliberate and graceful movements on all occasions. Since I have changed my practice in this regard, there has been an improvement in results, and I no longer am anxious as to the ultimate position except in those cases in which the patient is intractable, and the domestic management at fault.

It may be well to mention that, as in this method of regulating the position of the limb no account is made of the abductive power of traction by the hip splint, a perineal strap on the sound side is dispensed with. A single strap is more convenient, and has proved sufficient both as an ischiatic crutch and an agent for making counter-traction when the rack and pinion are used.

Summary.—The deformities of hip disease are caused by the patient's efforts so to place the limb that it shall be the least disturbed by, and afford him the most convenience in, his customary attitudes and movements. They are (1) abduction, (2) adduction and flexion, and (3) extreme adduction and flexion. The second posi-

tion is practically, by far, the most important, and is the only one considered in this paper. It is caused by the patient's elevating that side of the pelvis in order to take the limb off the ground, and to keep the affected limb out of the way of the well one, which is on the ground a longer time than the affected limb, and does most of the work of progression. The limb is maintained in the chosen position by reflex muscular contraction, which does not immobilize the joint, but fixes it in such a manner that changes in its position are readily made by the application of gentle but persistent force. It is proposed, therefore, to induce the patient, wearing the hip-splint, which protects the joint from the violence of walking, to divide the time on the ground equally between the two feet, or rather between the foot of the sound side and the ischiatic crutch on the affected side, with the expectation that adduction and flexion will be wholly or in part reduced, when the affected limb makes repeated efforts to reach the ground and do its share in locomotion. It is believed that the patient can be induced by precept and drill to adopt this change in the manner of locomotion, with the result indicated—a belief which is sustained by the observation that patients led by accident to walk in this way have recovered with a good position of the limb, and by the results of the adoption in practice of this method of preventing deformity.

THE VALUE OF MOTION IN THE TREATMENT OF HIP-JOINT DISEASE.

By W. R. WHITEHEAD, M.D.,
DENVER, COL.

Probably no surgical ailment is provocative of more discussion than the management of hip-joint disease, if we judge from the diversity of opinion regarding this subject.

The difficulty of a right understanding of how we shall treat this disease, generally, I believe, arises from a too contracted view of the means best adapted to combat the different pathological conditions of morbus coxarius. Some surgeons confine their treatment to immobilization alone, as the best means, because by this the pain is allayed, and if motion is permanently abolished they think it a necessary evil attendant on the treatment, and console themselves with ankylosis of the joint.

Other surgeons regard immobilization as a valuable aid to treatment in conjunction with passive motion and the timely and appropriate use of extension and of ice-bags to the joint. I am of this number, and look upon motion as thus practised as an essential part of the treatment of hip-joint disease. To restore as far as possible the functions of the limb is, in my opinion, the duty of the surgeon.

The suitable use of the means above cited, often is a difficulty not always readily appreciated, and failure in getting good results is not infrequently due to a want of intelligent care.

The different appliances, such as splints and extension braces, often ill suited to carry out the right treatment, are a source of annoyance to the attendants and of discomfort to the patient.

My own ideal of a properly managed case of hip-joint disease is all that I could wish for, and combines immobilization with timely extension and motion, provided an intelligent watchfulness is exer-

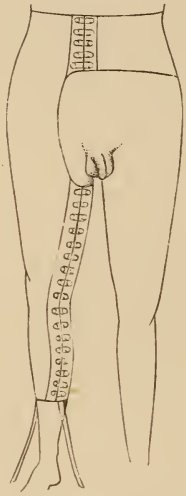
cised by the attendants to preserve the functions of the hip-joint by a right use of passive motion. To this end it is essential that the motion should be properly made, after subsidence of the inflammation, by the surgeon and rightly repeated in his presence by the attendants; extension being made at the same time "in the line of the deformity" to the extent to which this exists, as Sayre has pointed out. I must confess, however, that this is a most difficult thing to accomplish properly and successively, as negligence or gross misconception of the manner in which the extension and motion should be practised, leads to only partial motion, or possibly none at all, at the coxo-femoral articulation.

The neglect to fix the hips well by an assistant on a smooth, unyielding surface, while motion is attempted; and also the neglect to make proper extension at the time of attempting motion, at the subacutely inflamed joint, are frequent errors in the attempts at passive motion. A misleading movement of the pelvis occurs, while the hip-joint remains "locked" by muscular contraction, and thus the attendants are deceived with the erroneous belief that they have been daily practising motion at the hip-joint.

If the surgeon, wishing by the aid of an extension brace to maintain the functions of the joint by judicious passive motion, should remit his urgent instructions to the attendants, or should remit his constant attendance on the case, he often finds that there has been a provoking misunderstanding of the proper manner of making passive motion, or an utter disregard of his advice. Indeed, I am not surprised at the failure which frequently follows the attempts to treat this disease.

The following plan of treatment which I have resorted to, although not that which I prefer, yet I believe in many cases to be the best, because it is a labor-saving method to the surgeon, and one best adapted to the intelligence and patience of careless or dull-witted attendants; and which at the same time permits of motion at the joint when the apparatus is removed. In the first place, the limb must be brought to a straight position by extension weights, and rest in bed, and ice-bags to the hip and groin as in preparing the limb for an extension brace such as Sayre's. After this the limb and hips are encased in an apparatus such as shown in the accompanying figure, made of *papier maché*, of felt, or of plaster-of-Paris,

and laced. I have used plaster-of-Paris applied over well-fitting net drawers, with the same care and precautions as when a plaster-of-Paris bandage is applied to a broken thigh; with the exception that when sufficiently set I cut the plaster at the waist in front, and along the inside of the thigh and leg and remove it.



After two days the light plaster-of-Paris cast is trimmed, lined inside and out with the net Jersey material like the drawers, and finished for lacing like Sayre's light plaster-of-Paris jackets for spine disease. Adhesive plaster, along each side of the limb secured with bandages, and with webbing attached, permits of the use of an extension weight at bedtime. To practise passive motion the apparatus should be removed once a day or oftener; and can be removed at night if the extension weight be applied. The use of such an apparatus is as simple as the use of a hoe; and although extension at the joint is not obtained when the patient is up and about, yet immobility, and great freedom from pain are secured, and with the aid of a crutch or cane the patient gets about with more satisfaction than in an ill-adjusted extension brace, however well designed it may be. Even by this method of treatment, considerable vigilance is needed in the practice of passive motion, and should be urgently insisted on.

THE DIRECT TREATMENT OF MALPOSITION IN THE EARLIER STAGES OF HIP DISEASE NOT ESSENTIAL.

By BERNARD BARTOW, M.D.,
BUFFALO, N. Y.

In a very brief manner I wish to invite attention to a plan of treatment, purely fixative in character, which I have employed in the earlier stages of hip-joint disease. In the opinion of the writer, it embodies a new idea touching the management of the malposition of the limb that is due to reflex muscular contraction. It also possesses advantages in the matter of fixation of the inflamed joint, by securing a more extensive hold upon remote parts, whose functional exercise tends to induce movement in the hip-joint. In addition to the latter, it is attempted by this plan to supplement the quality of fixation which the apparatus maintains by utilizing the immobility of the inflamed joint which depends on reflex muscular spasm.

The employment of this method by the writer has been found to reduce to the minimum the labors incident to the care of the patient by both the surgeon and the attendant; and in point of expensiveness it is devoid of many of the objections that pertain to other methods in which expensive apparatus is often a prerequisite.

The plan consists, essentially, in having the patient suspend himself by the head—in the manner required for the application of the plaster-of-Paris jacket in spondylitis. During this operation the foot of the well limb is made to rest on a block, from four to six inches in height, so that the affected limb will, by its own weight, exert traction upon the muscles about the hip-joint.

The trunk and limb, having been encased in stockinet, should then be wrapped with cotton wadding bandages, to protect the surface, from the sixth or seventh rib to the middle of the leg. Over this

dressing plaster-of-Paris bandages should be applied in a manner to include the trunk, hip, and limb within the limits indicated. Three strips of thin malleable steel should be bent to conform to the contour of the body and limb, and inserted between the bandages on the anterior, lateral, and posterior parts of the dressing. As soon as the dressing has become hard it should be trimmed out on the inner side of the thigh, where it passes under the perineum, and all of the edges smoothed to prevent chafing of the skin. A high shoe and crutches having been provided, the patient may be taught their use with the least possible delay.

The splint thus formed will hold the hip-joint in an immovable manner. It will possess sufficient strength to permit of the patient being lifted or carried without causing pain, or the fear of painful movement of the joint.

In every instance in which I have used this dressing the patient has manifested relief from irritation as soon as the splint was completed. That this relief was not of a transient character could be seen by the cessation of all of the usual forms of irritation (including night pains), the return of the appetite, and evidences of an improved state of nutrition.

The immediate disregard of the matter of malposition of the limb is the point that first requires comment in this connection. When the patient is in the position of self-suspension, that part of the malposition of the limb which depends upon voluntary muscular action is immediately overcome. The remaining malposition is purely reflex in character, and ordinarily would not disappear except by continued traction, the patient meanwhile being confined to the bed.

My reasons for ignoring this malposition at the time of applying the plaster-of-Paris dressings are, that at this stage of the disease it is reflex, and therefore only a symptom of irritation in the joint, aggravated by movement, pressure, or capsular distention. By annulling movement and pressure in the joint as quickly and completely as possible, the relief from irritation from these causes would be followed by gradual relaxation of the reflex muscular hold upon the joint. The rest afforded the inflamed structures during a period of five or six weeks, by complete fixation of this character, would, when the splint was removed and the patient again suspended, permit the limb to drop into a position of diminished flexion and abduction.

The degree of correction in the malposition, thus obtained, could be immediately secured by the reapplication of the dressing. The repetition of this process at intervals of four or six weeks would further lessen the amount of malposition, so that when three or four dressings had been applied, there would be no greater degree of flexion than is commonly found soon after a portative splint has been put on, following a course of traction treatment for the correction of deformity. The patient has been saved the tedious experience of confinement incident to the latter plan, and has had the opportunity, from the beginning of treatment, to acquire physical vigor by exercise in the open air.

Those cases in which retrogression of the morbid process promises a partial restoration of movement in the joint, are not hindered by this method, in the reëstablishment of this function, in a greater measure than follows treatment by traction. On the other hand, when ankylosis is the probable outcome of the disturbance the angle of flexion is no greater than is necessary for the best usefulness of the impaired limb. Turning to account the reflex muscular contraction, to assist in the fixation of the joint, greatly augments the control that may be exercised over movement in the joint. So efficient in my experience has been this plan, in giving relief from painful spasm of the muscles, that I no longer regard traction as necessary for that purpose, or even desirable in comparison with the plan suggested. The efficacy of the splint depends, in a large degree, on the extent of the grasp it maintains on parts above and below the hip-joint. No discomfort has been observed to follow encasing the trunk in the bandage, except that patients are not able to ingest the usual quantity of food at the regular hours for meals. This is easily overcome by directing them to take food at shorter intervals. The splint permits the patient to rest in a partially sitting position, by leaning on the buttock of the well side against the edge of a sofa or chair—the body and the affected limb meanwhile being held in an oblique position.

Between lying down, standing, and sitting in the manner described, the patient passes the time very cheerfully; and, when once the splint has been applied, the case may be said almost to take care of itself until it is time to renew the dressing.

When the malposition has undergone a considerable degree of reduction, or when it is probable that the residue will be permanent,

through ankylosis supervening, a removable splint may then be made of strong leather—moulding the leather into the desired shape by stretching it upon a plaster-of-Paris cast, made by removing the plaster-of-Paris splint and utilizing it for a mould. Such a splint permits of easy removal for purposes of passive movement or other necessary attentions to the welfare of the joint and limb.

Ultimately this splint may be taken off for short periods of time, to enable the patient to test the sensitiveness of the hip-joint by the use of the high shoe and crutches only. In this careful manner the patient may feel the way to his feet, and by heeding the least sign of reflex irritation may escape relapses that would tend to protract recovery. Up to the present time I have employed this method in eight cases, during the past two years; and although but one of these cases has made a complete recovery during this time, the remaining cases have made such satisfactory progress, under this plan of treatment, that I now give it the preference over all other methods that I have tried, for the management of such cases, in the earlier stages of the disease.

GENERAL DISCUSSION ON TREATMENT OF HIP-JOINT DISEASE.

Dr. V. P. Gibney, of New York.—The President asked me if I had prepared a paper for this discussion, especially as the Secretary seems to have made egregious errors in the duties assigned us. For instance, Dr. Ridlon is down for a paper on Fixation and Traction in the Treatment of Hip Disease, and he is not a traction man; while I am put down for a paper entitled the Mechanical *versus* the Operative Treatment. I disclaim any such title as that for myself; but notwithstanding all this, we have had quite a number of interesting papers to-day, and having paid the closest attention to all of them I thought, therefore, a few suggestions or points gathered from them would be worthy of our consideration this evening. I will present these points as I have taken them.

There is one point that has not been touched upon to-day, and I think a portion of our time could be properly spent on that, viz.: the mode of infection, or how the tuberculous process takes place in the majority of cases. I think most of us now believe that heredity plays

a very important part in the production of tuberculous disease. For instance, phthisical children develop phthisis from their mothers and fathers by infection or contact; that they by living in the same house and by inhaling the dust which contains the bacilli through the air-passages develop the disease. We see so many cases of children who have excellent lungs and air-passages that develop this characteristic lesion in the head of the femur or acetabulum, that it is difficult sometimes to explain how infection is brought about. We can readily see how a patient can be auto-infected; how, if there be a fistulous tract or sinus, the patient can be affected. This question, I think, can be profitably discussed this evening, and if there be any gentleman here that has positive views on the subject I am quite sure they will be acceptable.

Before I proceed further to the main points I would like to call attention to one statement made by Dr. Shaffer in his paper to-day: *Does the limp ever disappear in the early stage of hip disease without treatment?* Many of us, I know, are taught to believe that once a limp always a limp. It is true that the patient may overcome the limp somewhat, but whether this disability or halt is ever absent during the first stage I think some of us will doubt that. The statement was made to-day that in certain cases the limp disappeared. If that statement was made by the mother or father of a child, or some one who had been interested in the case, we could have given due credence to it; but to have a gentleman who has seen so much of the disease as Dr. Shaffer has make such a statement I was somewhat surprised. Whether that is true or not can be attested this evening. I confess I have never seen a patient who once began limping with hip disease lose the limp until the case had been some time cured.

One of the chief questions for discussion this evening is whether it is admissible, or is good orthopedic surgery, to correct deformity in the second stage by operation, or by other than a traction splint, or by weight and pulley in the usual manner. There are some gentlemen I know who use a portative splint. They do not put the patient to bed, but rely on the splint itself for correcting deformity. There are others who resort to fixation and traction in overcoming deformity. The question arises whether it is good orthopedic practice to take a limb in the second stage of hip disease, put the child under ether, and by manual force and tenotomy put the limb in position and apply an apparatus. This is a good point for the Association to consider. It has been claimed that this is un-orthopedic, and it is not the proper thing to do. So far as I am personally concerned, I believe there are many cases, especially in hospital and dispensary practice, where it is

perfectly admissible, and is good orthopedic surgery. I believe we save time by it. Whether we do any violence to the hip or parts by this manual correction or not I certainly am not in a position to say. I confess I have corrected a number of cases by this means, put on a traction splint after correction, and I have had no untoward results. Understand, I am not arguing or pleading now for what is known as *brisement forcé.* I simply claim that it is admissible in a number of cases to put the limb where you desire it by manual force under ether rather than put the patient to bed, put on weight and pulley in the line of deformity, and make traction or put on a splint. The rule is, I think, where a high degree of deformity exists, to put the patient to bed, put on pulley with a view to overcome the spasm, then gradually lower the line of traction to get the limb in good position; while some other men who use a traction splint do not employ this method. They put the splint on the limb, making it correspond to the angle which the limb bears to the pelvis, make traction in the line of deformity with the perineal band resting against the front of the pubes rather than the perineum. They claim to overcome deformity in this way.

Does the portative splint prevent flexion or abduction? The gentleman who read the paper this evening was inclined to think it does not. This is an important question, because a large number of us believe it prevents flexion, adduction, and deformity. We believe it is not only useful in correcting deformity, but in preventing it as well. I am quite sure that a number of cases with a simple splint, or perineal crutch (such as is used by Dr. Judson) applied, have no adduction, as shown by measurement in Dr. Lovett's table. So that my claim is that the portative splint is capable of preventing flexion, adduction, and deformity.

Another point arises, and it is this: Does the splint protect the hip? I claim that it is a protective splint. I apply this splint and the patient walks about. It does not perfectly immobilize the limb; it simply protects the joint against trauma, so that recovery can take place. A number of gentlemen have reported favorably on that point, and a great many believe it is a good protective splint.

Another question which I think you will all take pleasure in discussing is, How long on an average should we protect by the splint an excised hip? Those of us who have operated a few times, and who are unfortunate enough to get sinuses persisting some time, feel that it is necessary to keep a protective or traction-splint applied almost as long as it is necessary, in the average hip not excised. Just how long we

should keep the hip protected or the patient from using the limb, is a matter that should be settled this evening.

The question raised by Dr. Judson was interesting. He claimed, I think, that reflex spasm was not traumatic, and that our efforts to overcome this reflex spasm were not in the right direction. In other words, that brings up the whole question of traction, whether it is necessary or not in the treatment or management of the case. Those of us who have hung tenaciously to the possibility of producing traction by means of the hip-splint or weight and pulley have, until recent investigations, given that up and contented ourselves with saying that we overcome reflex spasm to such an extent that the articular surfaces are not brought into contact to produce trauma. If it is true that reflex spasm *per se* is not a traumatic influence, then the value of traction is certainly lessened. Personally, I believe reflex spasm itself causes a vast amount of trauma, but I am also willing to admit that some of the best results among my charity cases have been obtained without the traction-splint, and with the simple perineal crutch arrangement. Sometimes there has been no continued traction in my cases, yet I know that patients with a high shoe on the sound foot and walking on the perineal crutch get on without pain. They sleep well at night, and seem to increase in strength and general health, and whether abscesses occur or not they somehow get well with remarkably good limbs. Now and then, if the good result obtained is from the perineal crutch, and not from the traction, I am willing to change my views somewhat upon this subject.

In closing, Mr. President, I would like to add my testimony to the value of plaster-of-Paris dressings as a means of treatment proposed by Dr. Bartow to-day in his paper. Some of my best results in double hip cases have been obtained with *double spica*, as we call it, the plaster carried from the axilla down to the calves, trimmed out well, putting the plaster on in the manner in which I find the limb. After a few weeks I am able to reduce the deformity, as the limb falls by its own weight, and I get a still better result; and finally when the limb is straight, by protecting the joint long enough it seems to come out in good position. The plan, therefore, which he proposes is certainly very commendable, and especially so to those gentlemen who have not the opportunity of securing the proper appliance they need.

Dr. Herbert L. Burrell, of Boston.—There is one point I should like to refer to, and that is with reference to the subsidence of the limp, during the course of the disease, spoken of by Dr. Shaffer. I feel quite sure I have seen this in certain cases, not, however, without treatment.

We have cases that come to the Children's Hospital where it is difficult to make the diagnosis. The child perhaps has a slight limp, we send it home and request that it be kept in bed a week. The mother returns with the child, there is no limp, and the limb remains this way for possibly a month or two, when the child returns again with a recurrence of the limp.

Dr. A. M. Phelps, of New York.—The important point in the treatment of hip-joint disease is to immobilize it absolutely and to relieve interarticular pressure. I do not care how it is done. I believe these are the fundamental principles in the treatment of the disease. For this reason it is difficult to put these cases upon a hip-splint and allow them to walk about. I usually put them in bed and absolutely immobilize them there until all pain is gone, the deformity overcome, and the active stage is passed. I heartily indorse that plan of treatment; then any apparatus which will carry out the above ideas can be used, only see to it that interarticular pressure is removed, trauma prevented, and the joint fixed until cured.

In regard to spasm of the muscle, and the long traction-splint in common use. It is supposed to operate against the muscle. If I understand the anatomy of the hip-joint and the muscles affected by spasm, traction should be made in the line of the axis of the neck and not of the limb. The adductor and abductor muscles which are affected by spasm act on a line corresponding to the axis of the neck. If we wish to control the spasm of this muscle, traction must be made in a line with the neck. We must deal with the muscle which operates to impinge the head of the bone against the acetabulum. A long traction-splint that does not control these muscles is as unscientific as it is irrational, if one believes that the spasm of the muscles should be overcome. To relieve the spasm of these muscles, two lines of extension are required—one in the line of deformity, and the other at right angles to that line. After the spasm and pain are relieved I put the patient upon a high shoe on the well leg and some sort of immobilizing apparatus on the diseased limb until it is cured, making traction at the same time in the line of the axis of the neck. The splint I use grasps the limb in such a manner that extension is made in the line of deformity and at right angles to that line, the patient being put on a crutch and not allowed to step on the diseased limb. No case of hip-joint disease should recover with angular deformity, and any hip-splint or crutch which does not prevent this calamity does not do all that might be done, and it should be discarded.

Now, with reference to excision of the hip-joint. I should say it is

better practice not to plunge the knife into the hip-joint at once. In the case of a debilitated child, if I should be compelled to do excision, I would go slowly down to the joint, ligating all the arteries as the operation proceeds, so as to avoid hemorrhage. If the head of the bone must be removed, it is much better to remove the great trochanter also, as the results are much better than in cases where the trochanter is left.

Dr. John E. Weeks, of New York.—I did not expect to receive an invitation to participate in this discussion. I feel that I, as a general surgeon, should come here to learn how to treat hip-joint diseases, and not to offer suggestions as to the best plan of treatment.

It seems to me in the consideration of this important subject that the treatment must be adapted to the stage of the inflammation. In the first stage we have unmistakable signs of the existence of the disease, and when the patients come to us the hip-joint is in a state of acute inflammation, and the fundamental principle of the inflamed joint is absolute rest. The various methods for fulfilling this indication are numerous. The method which I have been accustomed to adopt is to place the patient in bed and put on extension by means of Buck's apparatus, weight and pulley, making counter-extension by elevation ; and here arises the question raised by one gentleman, whether under these circumstances it is better to bring the limb into line at once, and then put on extension, or whether such extension should be made in the line of the limb in the flexed position, and gradually bringing the part into position. It has been my plan to make the extension in the line of the limb during flexion, elevating then gradually depressing it as the rigidity of the muscles subsides, and as the inflammation gradually disappears. It seems to me that this, on general principles, is a better plan than forcible extension, which is liable to do violence to the inflamed joint. The patient is kept in bed for a few months till the active inflammation is subdued, tenderness gone, and pressure can be made upon the trochanter or knee and the articulating surfaces can be brought into apposition without pain.

I will say here, gentlemen, that many patients come to me, and after having put on Buck's extension apparatus, they have been allowed to sit up in bed ; when the inflammation subsides there is flexion, the limb being flexed in the upright position, which requires subsequent osteotomy to bring the limb into line. After the subsidence of the acute inflammation by rest in bed and Buck's extension apparatus, I am in the habit of allowing the patient to get up and put

on Hegel's posterior splint, which has been a favorite splint of mine; sometimes Sayre's splint, and sometimes I put on a high-heel shoe on the well foot and allow the patient to go about. I think the fundamental principle is rest, seeing that the limb is kept in proper position for ankylosis, which is liable to occur, and at the same time to carry out all local treatment. I think we ought not lose sight of general treatment, whatever may be our theory as to the origin of the disease. In a vast majority of the cases I have seen there has been a predisposition to tuberculosis. I do not mean by this that a child has apparent tuberculosis or scrofula, if you make any distinction; but there is a certain condition of the system which is inherited from the parents which predisposes that child. In one case it may be tuberculosis of the lungs; in another case tuberculosis of the knee- or hip-joint, and that the accident or blow is simply an exciting cause which awakens the inflammation in the hip- or knee-joint, so much so that we should not lose sight of the medical and local treatment.

Dr. George W. Ryan, of Cincinnati.—My position so far as the treatment of hip-joint disease is concerned is this: If I see a case with considerable flexion, I put the patient to bed, reduce the deformity, then put on an apparatus which resembles more closely that used by Dr. Judson than any other. I occasionally use plaster-of-Paris in dispensary work. I have used a leather splint, but not with the same satisfaction as a traction splint. My ideas upon the best treatment of hip-joint disease are far from definite. I am not sure that traction is the best treatment, nor am I sure that rest is the best form of treatment, as exemplified by Thomas, of Liverpool.

The question of excision is an interesting one to me. Dr. Yale has said that excision is a good "febrifuge." That puts in a few words the limits of excision, because in the case of a child with a considerable amount of suppuration, and with a tendency to amyloid degenerations, it is valuable. It reduces the temperature in a great many cases, and improves the general condition of the child. I believe in extreme cases it is valuable, but I do not think that outside of them it is of much service.

We all know that few children are susceptible to tuberculosis of the lung, but that the tubercle bacilli enter the system by way of the lung in every case on the mucous membrane, generally after an attack of measles or bronchitis, and in that way they gain access to the circulation, and are then carried to the epiphyseal line of the bone. I do not think trauma is necessary in these cases.

There are many cases in which traction does not relieve pain. I have used the salicylates as recommended by Dr. Lovett with a great deal of benefit, and with the same view he did, that the trouble was not rheumatic. This is my position regarding the treatment of hip-joint disease. I take the cases just as I find them. If I can stretch and put a limb in good position with a portative apparatus, and it makes the child comfortable, I keep that up. Sometimes where there is extensive disease, and there are two or three discharging sinuses, the question of excision comes up. I do not believe in advising excision, for I have seen cases where excision has not proved satisfactory. I have seen a half dozen cases and the after condition was far from good. There were three to four inches of shortening, several discharging sinuses, and the limb was worse off, in my opinion, than if treated by other means. Do not understand me to say that the condition of the limb was altogether due to excision. It had failed simply in many of them to be of any benefit.

Dr. Charles C. Foster, of Cambridge, Mass.—I think we all believe in traction more than some of us realize. The strongest opponent of traction at least allows a leg to hang with all its might; he never thinks of supporting it.

Dr. Ridlon.—Dr. Gibney says that the portative traction splint prevents deformity. If he means that the traction splint used as a portative apparatus prevents deformity, I would not agree with him; but if he means that the portative traction splint, used not as a portative apparatus, but as a means of obtaining traction when the patient is recumbent, prevents deformity, I would agree with him. Again, if he means that the splint used as a perineal crutch, but not as a portative traction machine, prevents deformity, I would agree with him. Used with the patient recumbent it acts to diminish joint motion, *i. e.*, to immobilize the joint; used as an ischiatic crutch it protects the joint from the superincumbent weight and from concussion; but used as a traction apparatus during locomotion it increases the vertical motion at the joint. This answers in a measure Dr. Gibney's next question: Does the splint protect the joint? It protects it from the traumatism incident to superimposed weight and concussion as the foot strikes the ground, but it does not protect it from the traumatism of voluntary and involuntary flexion, extension, abduction, and adduction, and it directly favors the traumatism of vertical motion, in the push-and-pull action which it induces when the patient walks. The protection of all protection which the joint requires is immobilization

—in this I am sure Dr. Gibney agrees with me—and it is just this immobilization that the traction splint used as a portative apparatus does *not* give. Judson's ischiatic crutch, which is, I believe, a favorite apparatus with Dr. Gibney, does not seem to have the objectionable features which are found in the various forms of traction hip splints.

We all agree that immobilization is desirable; but if we agree that it is desirable, why should we not endeavor to obtain the most perfect immobilization possible, instead of contenting ourselves with only the partial immobilization which the traction splint gives? We all agree that the removal of the superincumbent weight is a thing to be desired; then why not remove that weight in the most effective way we can? I think we all agree that traction in certain cases is desirable and advantageous; but if it is desirable at all it should be continuous and uninterrupted. We have means at hand to obtain traction, constant and uninterrupted; then let us use those means and not the "portative traction splint," which pulls the diseased head of the femur downward from the diseased acetabulum and then allows the muscles to push it up again three thousand times an hour during all the long hours that the patient walks about.

Dr. L. A. Weigel, of Rochester, N. Y.—On account of the varied character of the papers read to-day my remarks will be rather desultory. I have noted a few points of special interest to me, upon which I will say a few words.

If I understood Dr. Shaffer correctly this morning, he made the statement that under the influence of anæsthetics the reflex muscular spasm is abolished, and we would get, in consequence, a free, movable joint. I do not think that this occurs in all cases. I have put patients who had a very decided hip limp, under the influence of an anæsthetic, and found that after abolishing voluntary muscular action and spasm, there was a very noticeable limitation of joint action.

The use of adhesive plaster for making traction was referred to by Dr. Judson, I believe. While nearly all portative traction splints necessitate the use of adhesive plaster, applied to the skin, it seems to me that an appliance which would exert traction upon the mass of muscles surrounding the bone would be more efficient. There are other objections to the use of adhesive plaster which need not be enumerated.

The remarks of Dr. Gibney with reference to operative treatment for the correction of deformity are worthy of note. I have at present a boy under treatment at the Rochester City Hospital, who was

admitted with advanced hip disease. There is a flexion of about eighty degrees and a less degree of adduction. He has been in bed with traction applied in the line of deformity for a number of weeks, and I cannot see that the deformity has been reduced to any noticeable extent. In cases of this character section of all the muscles which hold the joint in an abnormal position would appear to be justifiable, particularly when motion exists to an appreciable extent. Tenotomy or myotomy would at least eliminate the muscular element of deformity, and possibly shorten the period of treatment.

The use of plaster-of-Paris dressings in the treatment of joint disease is convenient and simple. It certainly is efficient in correcting deformity resulting from acute joint inflammation, because it fixes the articulation and secures the rest we now look upon as a necessity for overcoming reflex muscular spasm. The advantage of the method of Dr. Bartow is its cheapness, its applicability in the treatment of hospital cases or of out-patients at hospitals where the means for obtaining other appliances are limited.

Dr. Willard.—We are more nearly unanimous than we appear to be. I think we can really sum up the treatment in the word *rest*. Rest is the best treatment for all forms of inflammation. I may take one method of producing rest, and another surgeon may adopt some other method of producing it ; we are both working for the same end. We can get good results by both plans. That method which will induce the most perfect rest will give the best results. I have long held to the doctrine that the most thorough fixation we can secure is the best means to prevent deformity, relieve muscular spasm, reduce inflammation and lessen the ankylosis. It is not a question of theory, but one of observation. I know that thorough fixation will relieve muscular spasm in a large majority of cases ; I do not say in all. I do not think we can treat all cases alike. Quite possibly those of us who are practising fixation are really securing more traction than the most ardent tractionist. During the dangerous moment of traumatism—namely, when the weight of the body is brought upon the perineal straps, when the patient is allowed to walk about upon his splint, I believe that that pressure is produced by the head of the femur upon the acetabulum. When the child is allowed to walk about with axillary crutches, with the weight of the limb constantly making traction downward, we have one-sixth or one-eighth of the weight of the body. If the child weighs sixty pounds, we have eight to ten pounds of traction constantly, and I do not think that there is any traction splint which will exercise that amount of traction while the body weight

is upon it and the child is walking about. I contend, therefore, that axillary crutches are far better than the perineal or ischiatic crutch, because (1) we greatly lessen traumatism in walking and remove it further away from the inflamed joint; and (2) we have continuous traction upon the muscles. In every step that is taken with an inflamed limb, we are certain to have a little traumatism, no matter how great the traction may be. The ordinary traction splint gives a small amount of fixation but fails to produce the fixation which is necessary. Why? Simply because it does not extend far enough above the hip-joint. It is like splinting one fragment of a fracture. A thoracic support for the upper end of the hip-splint and axillary crutches, removing traumatism as far as possible from the joint, are the essential elements in any hip-splint. If these conditions are fulfilled I do not care then whether it is a fixation splint or a traction splint, we can get good results from both.

Dr. Benjamin Lee, of Philadelphia.—There is one means of local treatment in the early stage of hip-joint disease which I am very much in the habit of using, but which has not been alluded to, and that is the application of cold. It is my practice invariably in treating cases in the early stage to apply the ice-bag for a certain length of time, say about an hour daily. I instruct the person in charge of the case to fill the bag only partially, and to apply it in such a way that the surface is chilled both posteriorly and anteriorly. Of course, we do not expect to get any effect upon the joint by applying it over the trochanter, but I do believe that the application of cold anteriorly and posteriorly to the joint, especially in cases where there is evidence of decided inflammatory action, is of great value.

In regard to the dictum of Dr. Willard that our aim should be to secure absolute fixation and rest, I must take exception. I believe that any diseased part of the body or organ is most readily restored to its normal condition when it is allowed to perform—to a limited extent at least—its normal function. I do not believe that absolute fixation gives as good results as traction with limitation of motion, but still the allowance of a certain amount of motion. I believe that cases treated by absolute fixation are more apt to give us a result of limited motion than those treated by traction with limitation of motion and the allowance of a certain amount of the natural function.

Dr. Steele.—At our Washington meeting the "bone of contention" seems to have been, that where is disease of a joint, whether that joint should receive rest, or whether if a certain amount of motion was allowed the reparative process could go on. I had hoped that we

might determine that question this evening. If there is any inflammation in or about the joint, it should be kept still until the disease has passed away. Has that point been settled? I presume we wish to go on record as an Association as to whether the so-called American idea of motion without friction is proper treatment or not.

Our friends tell us they get good results with motion, but perhaps their cases would not last as long as they do if they thoroughly immobilized the joint. I acknowledge that the diseased focus lies deep in the bone. In the incipient stage we have reflex contraction. As yet the joint is not involved. You ask, Why immobilize that joint if there is no trouble in it as yet? For the reason if you allow motion in the joint, more blood supply is sent to it, more nerve irritation is directed to it, and therefore the local focus of irritation leading to tubercle is excited to more rapid action. If we keep the part perfectly still until inflammatory action subsides, in the early stage, even if the joint be not very greatly involved, we hasten the reparative process. When there is inflammation it certainly seems to me that the joint should be kept quiet.

A member says we should make traction in a direction opposite to which the joint bones are in contact, not only extension downward, but also outward. As was illustrated in the admirable paper given us at the Children's Hospital to-day, in the adult femur the bones are forcibly brought in contact by downward extension, yet the acetabulum of the child is so shaped—shallow—that traction downward causes very little impact and contact indeed. Beside, the perineal strap has a tendency to carry the femur outward as well as downward.

In regard to the treatment of abscesses, I think that when they are recognized early they should be opened freely and treated antiseptically.

With reference to the question propounded yesterday as to the treatment of sinuses, I will say that as long as there is carious bone they will continue to discharge. I have been troubled with sinuses continuing even after I thought the destructive process had subsided, and the patients were up and about for some time and apparently well. The continual discharge from these sinuses is kept up by the lining fungoid tissue, which inoculates the surrounding parts. If we clean out the sinuses thoroughly, I think they will close up.

Dr. Lee.—I simply wish to give an illustration of what I mean by the continuance of function in a part in an inflamed condition. I suppose it is admitted that in sprain we have a certain amount of inflammation. The old treatment of sprain was, as far as possible, to give

perfect rest to the muscles and tendons. What was the result of that treatment? As a rule, six months were required for the treatment of sprain, and so great an authority as Professor Gross, who has been called "the Nestor of American surgery," stated that in his experience a majority of the amputations which were necessitated were for conditions which were the result of sprains. That gives you the result of absolute rest in the treatment of an organ in an inflamed condition whose function is motion. Now, I wish to say that absolute rest to a sprained muscle and joint is the worst treatment that could possibly be adopted. What a sprained joint and muscle need are in the first place such mechanical treatment as will remove the products of inflammation; and, secondly, such careful and judicious use of the function of the organ—that is, motion—as will assist in the removal of the products of inflammation. A sprained joint, treated properly, will usually permit the patient to resume its use in six weeks; treated by absolute rest usually not less than six montns, and possibly never.

Dr. Bartow.—The remarks that have been made relative to the maintenance of limited physiological motion in connection with traction, in the treatment of hip disease, suggest to my mind the improbability of there being even a slight degree of motion in the joint that is physiological in character, during the maintenance of efficient traction, and especially when this method of treatment is employed for the earlier stages of the disease. I have carefully observed a number of cases favorable for treatment by this plan by reason of only partial arrest of motion in the joint, from reflex muscular contraction. In all of these cases the effect of this form of treatment was negative as indicating the presence of physiological motion. Following reduction of the malposition and the application of the jointed traction splint, there was a recurrence of the malposition in quite a large degree a short time after the patients had been allowed to walk. I think this is an experience common with all surgeons who employ this form of apparatus. This clinical fact plainly indicates that the limited motion which the splint permits excites irritation sufficient to cause the renewal of reflex muscular contraction and malposition. Such motion, therefore, cannot be regarded as physiological. In fact, nothing but irritation could be expected to follow so recent an attempt to resume motion within the area in which motion had previously been restrained by reflex contraction. When, by prolonged tractive fixation of the joint, a modification of the irritative lesion has been effected, then limited physiological motion could take place in the presence of traction, the reflex muscular restraint being relaxed. Observation shows

that under the method of treatment the reflex fixation of the joint is a long-continued matter, and, if motion is restored in the joint, that the muscular hold upon the movements of the limb is not released until a comparatively late period in the treatment of the disease. The good results that are apparently due to treatment by "traction with motion" are, in reality, the effects of tractive fixation only. In my opinion, the results would be better and more quickly secured if the "limited motion" incident to this method were both practically and theoretically eliminated.

Dr. Robert W. Lovett, of Boston.—I shall have but a few words to say. I do not think that our discussions on hip disease are calculated to settle very much in the minds of the younger men, to whom the subject is still in its experimental stage. My experience has been derived almost entirely from the clinic that you saw this afternoon. A year ago I gave the records of some experiments with fixation and traction. Since then we found we could do better by using two perineal bands than with one, because in that way we got better fixation of the joint. When the progress of our patient is not more satisfactory, as a rule, we find that it is because the patients are going about too much; there is too much traumatism in the joint. Our improvements in results have all been in the line of adding better fixation to our traction.

I want to speak of the use of salicyate of soda, referred to by Dr. Ryan. Its use was experimental at first, but further use of it has led us to adopt it as routine treatment in sensitive hips among our outdoor patients with beneficial results. The drug given in large doses will generally control night cries, if used long with proper mechanical treatment. After putting the limb in position large doses of the salicylate of soda should be given toward night, which give quick relief generally, and the action of the drug seems also to lessen permanently the sensitiveness of the joint.

Dr. Judson.—I cannot recognize the trauma which is said to be caused by reflex spasm. It implies a vicious circle in which muscular spasm causes inflammation and inflammation in its turn causes muscular spasm. We know that hip disease has its natural termination or cure, which would scarcely be possible in the presence of such a mischievous arrangement as this, which rivals malignant disease in its malignancy. Furthermore, if pressure caused the destruction which we find, the articular surface would suffer before the cancellous interior of the bone, which is always affected first, although reflex spasm is the earliest sign of the disease. The physical evidences of injurious

pressure, found in changes in the shape of the head of the femur rather than in erosions of its surface, seem to me to be the evidences of the effects of the pressure and concussion which attend locomotion, and not the effects of muscular spasm.

Neither can I recognize the alleged counter-action of the muscles by traction, believing, as I do, that with adhesive plaster, applied over the skin and masses of cellular, adipose, and relaxed muscular tissue, we cannot practically get such a hold on the femur as to enable us to stretch the muscles which cross the line of the joint. We can oppose their reflex tension for a little while in favorable cases; but in every case in which we try to do this we apply, whether we intend to do it or not, what I believe is an inevitable attendant on traction as applied to joints—that is, a constant, comfortable, and beneficial fixation (not immobilization) of the joint.

I was brought up to believe in the efficiency of stretching the muscles in order to protect the articular surfaces from undue pressure, first as a pupil of Dr. C. Fayette Taylor, and afterward as an assistant at the New York Orthopedic Dispensary and Hospital; but in all I have written and said on these subjects, and I have written many pages, I have upheld the views now expressed, for the reasons which I have stated among others.

The relief afforded by traction in suitable cases is marvellous, and the appearance is that of an apparatus relieving pain by lessening articular pressure; but in my opinion the appearances are entirely misleading. I wish to take nothing for granted. In matters of religion I am willing to exercise a childlike faith; it is the way to the enjoyment of serenity and hope; but in medical matters I am a sceptic and want everything demonstrated down to the very last iota. This is what we should demand, especially in orthopedic surgery, where so many of the elements with which we deal are palpable, mensurable, and ponderable.

In closing, I would raise the question whether we are not responsible for the apathy with which the profession regards the hip-splint. We claim so much for it, and the things we try to do with it are so mysterious and require such nice and, in my opinion, fanciful adjustments, that I fear the unerring practical sense of the profession outside of our narrow circle will continue to neglect this apparatus which we find so valuable.

Dr. Lee.—Fixation means absolute absence of motion. I should prefer a term which would express extension with limitation of motion. But when we come to speak of fixation we employ an absolute expres-

sion; it means no motion whatever. Fixation I believe to be an impossibility.

Dr. E. H. Bradford, of Boston.—In discussing the treatment of hip disease there is danger of forgetting the fact that the disease is not a simple but a complex one; the conditions vary in the different stages of the disease.

In discussing the treatment of typhoid fever any physician would be laughed out of court who recommended any one drug exclusively, and equally true is it that rationally no one splint is to be advocated in hip disease.

There are certain indications which must be met in certain stages. In the acute stage, rest is essential, and the more rest the better. Traction properly used can be made a means of securing rest. It is not the only means, but it is always a help. Then comes a stage when we allow some motion. It is essential that the patient have air and exercise, and to give this some motion at the hip is unavoidable. This motion should only be allowed when the hip is protected from jar and increased muscular spasm. This may be termed protected motion. And finally there comes a time in convalescence when the joint is nearly well, when slight motion does not occasion harm, but when the limb cannot withstand unusual jars or the whole weight of the body in walking, and some form of crutch or leg support is needed until the epiphysis is thoroughly solidified. It should be borne in mind that there is a tendency to flexion and adduction of the limb and to subluxation at the hip-joint upward and backward, and that this must be combated in the active stage of the disease.

There is room for a difference of opinion as to the time when the different indications are severally prominent, and surgeons might differ as to the readiest way of meeting the indications, just as some surgeons in removing a tumor dissect with a scalpel, and others with scissors. The main thing is that the indications are severally met. The successful treatment of hip disease consists in the proper regard for protection of the joint from injurious motion and from jar of superincumbent weight, from the undue force of spasmodically contracted muscles, from the injury from too long confinement.

In regard to appliances, Dr. Taylor's remark cannot be too often repeated, viz.: That theoretical excellence of apparatus is of little value as compared to the proper application and applicability in every individual case.

To sum up the points brought out by the different speakers, necessarily different as the points of view may be, we all agree:

1. That the weight of the body should be removed from the affected joint until complete recovery should take place.

2. That early excision is to be condemned when rational and thorough conservative treatment is possible.

3. That traction is an important element in treatment.

4. That in the painful stage, rest of the joint, as complete as possible, is of the first importance.

AN EXPERIMENTAL STUDY OF DISTRACTION OF THE HIP-JOINT.

By E. G. BRACKETT, M.D.,
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The value of traction in the treatment of the acute conditions of hip disease has abundant evidence, both in its relief of the symptoms and in its influence on the course of the disease. That, aided by mechanical appliances, it enables fixation to a greater or less extent to be obtained is certain, but the occurrence of a separation of the two joint surfaces, for which so much has been claimed, is a matter of dispute.

The experiments of Lannelongue demonstrated the possibility of its occurrence in the child's cadaver, but the results were not applied to clinical conditions.

The importance of definite knowledge on this point is surely self-evident, and it is the object of this paper to demonstrate the subject in its anatomical and clinical relations.

In this paper the term distraction is used to apply to the separation of the two ordinarily opposing surfaces, the amount of separation not entering into the significance of the term, so long as there is a breach of contact, this being all that is of clinical value. The opportunity for studying this on the living subject is necessarily limited, as the amount of possible separation is slight, and the means for measuring such more or less imperfect. The subject must, therefore, be carefully studied on the cadaver, and the results applied to the clinical conditions, with the consideration of the additional counteracting forces which are there met with. The demonstration will include a consideration of the anatomical peculiarities of the joint, and of the difference which exists between the adult and the child, and of the influences which tend to counteract the traction force so applied as to produce a separation.

In dealing with this subject there must be considered those conditions which exert a counter-force. These are the bony formation, the influence of atmospheric pressure, and the resistance of ligaments and of muscles. The first three can be studied on the cadaver, but the last is more difficult to estimate, and can be determined only by applying the results to the living subject, with the influence of this force in view.

Drs. Bradford and Conant have shown, on prepared specimens of the adult joint, that when a pull is made on the femur with the leg in the position of extension, the head of the bone is held in by the cotyloid ligament, but when the leg is flexed and abducted, the prominent part of the head is rotated outward, and traction easily pulls it from the joint cavity.

This anatomical condition is undoubtedly the most important of those which together maintain the contact of these two articular surfaces, and this important relation is easily seen by reference to prepared specimens, and is shown in the illustration.

The plane of the lower portion of the acetabulum is very nearly perpendicular to the line of the body, and when completed by the cotyloid ligament forms a surface of some size, which is nearly at right angles with the line of the leg. On this the head of the femur rests, with its most prominent point inside the cotyloid ligament. The angle of the neck with the shaft does not materially affect this relation. Traction, therefore, is mainly expended in pulling the head of the femur down against the bottom of the acetabulum, and much less in the direction of the axis of the joint cavity, and the direction which the bone must take, when a separation occurs, is almost directly outward, until the prominent part of the head has slipped by the cotyloid ligament. By examination of several prepared specimens I have found by rough measurements that this amounts to about one centimetre, varying a little in different instances, before the movement is decidedly downward. From this slipping outward it is held by the ligaments and muscles, which act in a direction not immediately opposed to this force but obliquely to it. This interlocking of the head over the cotyloid ligament is not so complete as of itself to prevent the head from slipping outward when traction is applied, but in the position of full extension the Y-ligament offers chief resistance to outward displacement.

If the leg is somewhat abducted, the most prominent point of the head of the femur is brought beyond the edge of this horizontal surface on the bottom of the cavity, and the most important relation is much changed; but on the other hand the Y-ligament is in no way relaxed, and therefore exercises its full influence in keeping the bone from slipping outward. When the leg is flexed, not only is the Y-ligament relaxed, but the bearing surface of the head is brought opposite the notch in the rim of the acetabulum. Although this is completed by the transverse ligament, the resistance is less firm than by the bony portion below, and traction in this position is less strongly opposed by the anatomical relations of the joint. If at the same time the leg is abducted, and the most prominent point of the head is rotated beyond the margin of the cavity of the joint, traction has but little anatomical resistance. Thus the anatomy of the adult joint is not favorable for the occurrence of distraction, although in no way preventing such. This subject in the adult is chiefly im-

portant for the purpose of comparison with the conditions found in the child's joint, and which is to be considered.

Atmospheric pressure has always been regarded as exerting an important influence toward the retention of the head of the femur in its place. Doubtless this force is one of the several, but the results of experiments do not bear out the claim that is usually made. The object of the first series of experiments which were made was to demonstrate the effect of the pressure, and to determine the amount and direction of the separation, if any, produced by a pull on the leg while the parts were intact.

These experiments[1] were conducted in the following way. Steel pins were driven firmly into the pubis, trochanter, and shaft of the femur, so that any movement downward or outward could be accurately measured. These were all conducted when the integument was unbroken, except for the pin-holes, and care was taken that the capsule was not punctured.

The traction was made with the leg in extension and in abduction, and by means of a graduated spring the amount of the pull was at first determined and afterward estimated.

TABLE I.

Experiments on cadavers of adults. Traction of twenty-five pounds (approximate). Change in relation of the two bones taken by measurements from pins driven in pelvis and femur for the length, and the distance between trochanters measured for width. Integument intact. Measurements in millimetres.

No.	Age.	Sex.	Angle of neck of femur.	Change in	
				Width.	Length.
1 (494)	40	F.	38°	+ of 6	+ of 8
2 (484)	45	M.	34	+ of 4	+ of 3
3 (495)	56	F.	40	+ of 2	+ of 2
4 (486)	37	M.	19	+ of 4	+ of 2
5	17	F.	31	Right + of 5	+ of 5
				Left + of 8	+ of 8
6 (485)	72	M.	...	Not taken.	+ of 2

The results in detail are given in Table I., and in brief are as follows: In four cases there was distinct separation, which in the horizontal plane varied between 2 and 6 mm., and in the vertical between 2 and 8 mm. The joints and bones were all examined

[1] These were done through the courtesy of Dr. Conant, of the Harvard Medical School, to whom I am also indebted for his valuable assistance.

afterward, and were found normal. The angle of the neck and the shaft did not seem to influence the result, and varied between 19° and 40°. In the cadaver of a girl seventeen years, the separation amounted to 5 mm. both outward and downward in the right hip, and 8 mm. in the left, in both planes. The angle in this case was 31°.

In most instances our efforts to produce a distinct separation were successful, but in two instances a separation under these conditions did not occur. In one the joint was found to be the seat of extensive disease, probably rheumatic; the other was stiff, the cause not determined.

In addition to these recorded experiments, many joints were examined with reference to this point, but of which no measurements were taken, as the separation in nearly every case was unmistakable.

There is no doubt that the effect of traction on the adult and child joint should receive separate consideration, as, owing to the difference in structure, the result of the force applied is not the same in both. This difference in both the cotyloid cavity and in the head of the femur, in the depth of the acetabulum, and the axis of the joint. The neck is short and joined to the shaft at a much smaller angle, forming rather a gentle curve than an angle, and the head and articular surface look more directly upward, due in part to this direction of the neck, and in part to the fact that it is joined nearer to the upper border of the neck.

Also, the plane of the lower portion of the acetabulum, instead of being horizontal, is directed obliquely downward, and does not present a surface for the lower part of the head—a bearing surface as in the adult, but the bone is held in place by ligaments and muscles, the fibres of which are more nearly parallel to the axis of the joint, and there is nothing in the bony formation of the joint to prevent a separation of the two surfaces, nearly in the line of downward traction. A separation is therefore indicated principally by a lengthening, and but very little or not at all by a widening at the trochanters, until at an age when the infantile character of the joint has disappeared. This change is of course gradual, as age advances and the character of the joint assumes more of the adult form; in proportion to this the separation is shown in part by widening. But at puberty the joint still retains considerable of its infantile type, and

the conditions of the adult joint which have been referred to can be only in part applied to it.

Considering these anatomical relations, traction here applied should be more effectual to produce a separation.

To study the effect of traction on the child's joint the cadaver of a three-year-old girl was used.[1] A traction splint was applied, and pins driven into the pelvis and femur, so that any change in relation of the two bones as indicated either by a lengthening or by widening could be accurately measured. Traction to the amount of 12 pounds was first tried, and this was then increased to 18 pounds. This was tried with the leg in extension, abduction, abduction and flexion. In the first series of experiments the capsule was exposed, and the joint opened by an incision parallel to its fibres. The results are given in Table II.

In the three positions there was an increase in both the length and width. The latter, however, was very slight being but 15 mm., except in the position of flexion and abduction. The increase in length varied between 2 and 3.5 mm.

In the second series no splint was used, but the pelvis was held in a vice, and extension made from a fixed point. In these the capsule was exposed but not opened, and in other respects the conditions were the same as in the previous experiment. In all the positions tried a decided lengthening was obtained, and varied between 2.5 and 6.5 mm., being greatest in the position of flexion, and least in extension. A slight difference in the amount of separation in the two experiments will be noted. This is probably due to the different conditions, as in the second the bony parts were held rigidly, which changed slightly the angle of the axis of the acetabulum and the line of the leg. The firm fixation also probably accounts for the greater lengthening in the position of flexion and abduction. It is seen, however, that the amount of separation with the leg extended is not greater than when the capsule was opened, and atmospheric pressure could have no influence.

[1] Through the courtesy of Prof. Dwight, of the Harvard Medical School.

Table II.

Subject: Cadaver of three-year-old girl. Hip-splint applied; capsule exposed and opened by an incision parallel to fibres. Traction made in positions of extension, abduction 35° and flexion and abduction both 35°.

Position.	Weight	Change in width.	Change in length.
Extension	12 lbs.	+ of 0.5	+ of 2
"	18	+ of 2	+ of 3.5
Abduction 35° . . .	12	+ of 0.5	+ of 2.5
" " . . .	18	+ of 1	+ of 3
Flexion and abduction .	12	+ of 2	+ of 1
" " " . .	18	+ of 1.5	+ of 3

Table III.

Subject same as in previous experiments. Left leg capsule exposed, but not opened. Pelvis held in vice, and extension made from a fixed point.

Position.	Weight.	Result.	
		Width.	Length.
Extension	12 lbs.	0	+ of 2.5
"	24	0	+ of 3.5
Abduction 30°	12	0	+ of 1.5
" "	24	+ of 1	+ of 2.5
Flexion 30°	12	0	+ of 4.5
" "	24	+ of 5	+ of 6.5
Flexion and abduction 30° .	12	+ of 1.5	+ of 4
" " " " .	24	+ of 1.5	+ of 5

An increase in length was not found in each instance in this second series, but the position undoubtedly differed slightly from that in the other experiment, probably due to the rigid fixation obtained by the vice. In one position, that of flexion, with a strong pull, it was found that the trochanter was nearer the line. This difference, although very slight, was unmistakable, and the observation was confirmed several times. With this there was 6.5 mm. of lengthening, the inferior border of the head had already slipped by the edge of the acetabulum, and the force of the resisting ligaments and muscles was inward. These experiments show the effect of traction force on the hip-joint without the resistance of the muscles, that is, considered anatomically only. We find that in adults a distraction may occur as the result of a force exerted through the leg, but that the anatomy of the joint offers a strong bony resistance, which is supplemented by the ligaments. The direction of this separation is outward and downward, the first motion being outward, and that this is indicated by an increase in width at

the trochanters and in the length of the limb. The greatest separation occurs in the position of flexion and abduction. The bone is held in place by the firm support obtained, the head on the floor of the acetabulum, where it is held from slipping outward by the ligaments and muscles. Of the former, the Y-ligament is the first to become tense and offers the greatest resistance.

In children the formation of the joint is such that very little bony resistance is offered, but this falls principally on the ligaments and muscles. A separation is shown by a lengthening of the limb, and very slightly by an increase in the width between the trochanters. The influence of atmospheric pressure was in all of these experiments too slight or unimportant to be considered. In the experiments with the child's joint there was no appreciable difference between the joint which was opened and the one left intact. The arrest in all cases seemed to be due to the resistance of the Y-ligament. In older subjects, where the axis of the joint had become slightly more oblique, after separation of this amount, the head would be arrested by its impingement against the lower edge of the cotyloid cavity, but in the living subject this amount of separation would scarcely be possible. In the experiments on the cadavers of adults as much force was required in the second experiment after a marked degree of separation had been produced as in the first. Were this a potent factor in maintaining the contact the result would have been otherwise; for this force must be one of suction, and this lost, the large capsule would permit considerable movement within its boundaries, without any change in atmospheric pressure. Also, were this an important factor the traction force would be expended in breaking the contact; but this once done, further separation would be comparatively easy; but this has not been the case in any of these experiments, even those positions where the Y-ligament is relaxed, but the amount of separation is roughly proportional to the force used, and the bone immediately slips back when the leg is released.

When this subject is considered clinically there is involved a new and important factor in the resisting force of muscular action. The results of the experiments on the cadavers can be applied to the living subject only with the influence of this in view, and require a consideration of muscular tenacity and muscular contraction. That the muscular power of the leg, and particularly of the thigh, is much

greater than any force we apply by means of weight is of course indisputable, but that it is sufficient to maintain a continued counter-force is at least not physiological. Yet, otherwise, this traction must be counteracted either by an active contraction or by normal muscular tenacity. Continued muscular contraction is well recognized to be impossible, even when slight exertion is expended, and of this we daily see illustrations too numerous to be mentioned. We are told by physiologists that after repeated stimulation a muscle finally fails to respond, and no contraction takes place—that is, after continued work further activity is impossible without rest.

Practically this is what is accomplished by continued traction. No opportunity is given the over-active muscles to rest, and their increased irritability to stimulation is diminished or overcome until a stimulus which before would result in a contraction receives no response; thus a state of quiet is substituted for one of spasm.

We have present, however, at all times, the normal muscular tenacity; but this is not a quality to maintain a continual resistance; that is, it is not an active working force, but is rather a condition of repose, while the resistance of a traction force. implies an additional energy.

A muscular contraction occasioned by the force of extension would be of the order of an ordinary reflex; that is, this attempt at an increase in length of the muscles, which the anatomy of the joint allows, would act as a stimulus to activity. Such a condition, if long continued, would evidently offer an effectual resistance to a traction force. But this on physiological grounds is, as has been mentioned, impossible, for after a considerable repetition of the stimulus the muscles fail to respond by a contraction and remain in a state of quiet.

There is one condition which undoubtedly plays an important part in this subject of distraction, namely, the adaptability of the muscles to different positions, whether producing an increase or diminution of its usual length, at the same time preserving its tenacity, without actual contraction, as is seen in the ordinary attitudes one assumes while at rest, or the positions in which a limb is kept for long periods of time in the course of treatment. Some in the instances are lengthened and some are shortened, thus showing that the length of a muscle is relative only, and that tenacity is an intrinsic quality

depending in no way on the extension or flexion of the limb, or on the relative distance between the origin of a muscle and the insertion of its tendon. Therefore a separation which is anatomically possible may occur without such an opposition from the muscles, *i. e.*, a reflex contraction, as would be occasioned by a change in their length from this disturbance of the bony relations, their elasticity or extensibility allowing such change when within normal limits.

We have in congenital dislocation a condition in which this action of the muscles while under traction can be studied—the claim being that the muscles adapt themselves to the difference in length, retaining their tenocity but not being in a state of contraction, *i. e.*, that the muscular action does not exert an influence against distraction, merely because it implies an increase in length, especially so since this increase is so slight. If this is so, then in congenital dislocation, in which the bony and ligamentous structures permit abnormal motion to a certain extent, there should be, under continual traction, a decided lengthening, varying with and limited by the laxity of the ligamentous structures.

To determine this a girl of twelve, the subject of a right congenital dislocation, was put on continual extension of six pounds. The child was healthy and well developed, and the leg on the affected side was nearly as strong as its fellow. The measurements were taken on three days and confirmed each time by repeated trials, both with the weight on and off. In each there was a difference of nine mm. in favor of lengthening, the first two being taken after six pounds, the last after ten. The leg was carefully examined for spasm when the extension was on, but there was no sign of such at any time, and this condition was allowed without any irritation response.

Thus far these observations have been purely experimental in character, but on their theoretical basis admit the possibility of distraction in children. That is, we are dealing with structures which are capable of yielding a certain amount, which have only elasticity to oppose this traction, and with the muscular force which can oppose only active contraction, but which cannot exert a continued opposition, and by repeated stimulation they are reduced to a state of rest.

The demonstration of this on the living subject is obviously difficult. In small children the axis of the joint so nearly coincides with the line of the leg, that a separation of the two joint surfaces is shown

but little by a widening at the hips which is easily measured. In older subjects this is greater and can be used as an indication of distraction, but occasionally a favorable subject will be found, in whom the bony prominences are so sharply defined as to enable accurate measurements to be taken. I have a few of these which were taken with great care, and in which the same results were obtained in several trials. Whenever the conditions were such that accuracy was not made certain by repetition the case was not used.

Below are given the results from two subjects, aged twelve and nine respectively, both of whom were under treatment for hip disease. They were, then, under the same conditions during the experiment that are present when traction is usually applied, except in one instance, the weight was much greater than would ordinarily be used.

TABLE IV.

No.	Age.		Weight.	Difference in length.	Difference in width.
1	12		8 lbs.	+ of 3 mm.	+ of 3 mm.
2	9	Right	6	+ of 8	0[1]
		Left	16	+ of 8	+ of 3

In addition to those are a number of observations on children between the ages of three and six years, but in which the width only was taken. The results are given below. In those of about the age of five or six, an increase in width of one to two millimetres was found in the majority. In several no difference was found, and in two young subjects a narrowing of two millimetres was obtained.

TABLE V.

Measurements of width at trochanters, with and without traction. Length not taken.

No.	Age.	Sex.	Weight.	Result.
1	5	F.	6 lbs.	+ of 2 mm.
2	...	M.	3	+ of 1
3	8	M.	6	+ of 1
4	5	F.	8	— of 2
5	5	M.	6	— of 2
6	6	M.	4	+ of 2.5
7	6	M.	4	+ of 1.5
8	7	M.	4	+ of 2
9	6	M.	4	0
10	5	F.	8	+ of 1

[1] The presence of abduction probably accounts for the difference in the two sides, more than the disease, which was on the right side.

From the experiments and observations the following conclusions are drawn. The anatomy of the joint in small children does not offer any obstacle to a separation of these two surfaces in nearly the direction of the line of the leg; but in older children, when the structure of the joint is beginning to assume the characteristics of the adult, some opposition undoubtedly is encountered. The ligaments offer a resistance which is yielding to a greater or less extent, particularly so in the older children, where there is more bony opposition, and their fibres run in a direction oblique to that of the separation. Experiments show that distraction is an evident anatomical possibility.

The muscles allow a motion in this direction within the limits of any possible distraction without being stimulated to a contraction by such change. When, however, the muscles are already in a state of spasm, they are reduced to a condition of quiet, and when in this state exert no active resistance to their slight separation of the joint surfaces. The manner of reducing this spasm is purely physiological. Then increased activity is due either to an excess of stimulus, or to their increased irritability to ordinary stimulation. By this continual traction, which is simply a means of producing muscular exhaustion, the ability to respond to the stimulus is overcome, or so much diminished that spasmodic contraction does not oppose an active counter-force to the traction. Therefore, if on anatomical and physiological grounds this separation is a possible fact, it should be a clinical reality.

The claim is not made that wherever continued traction is used distraction occurs. Possibly not in cases of old disease where there are extensive bone changes or where there exist contractions and adhesions which have resulted from inflammatory process. Nor that it does usually occur when used against contracted structures as in the correction of deformity, and certainly not when the extension is poorly applied or with ill-fitting apparatus. But the claim is made that in ordinary cases a breach of contact does occur, and that this may happen even after disease has existed for some time; that this means affords relief to the spasmodic condition which is the source of so much suffering in the course of acute disease, and its influence is beneficial, not only by alleviating the pain but also

by preventing to a greater or less degree the mechanical injury to the diseased parts, from this condition of excessive muscular irritability.

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AN ANALYSIS OF TWENTY-ONE CASES OF HIP DISEASE TREATED BY THE THOMAS SPLINT.[1]

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At the request of Dr. R. W. Lovett, an attempt has been made to find out and to record in this paper exactly what have been the results of the Thomas hip splint as applied in the Boston Children's Hospital.

The splint, it should be stated, has been applied here by men, some of whom have seen Mr. Thomas's clinics, and others of whom have faithfully carried out the directions given in his *Hip, Knee, and Ankle.* Special malleable iron for the material of the splint has been obtained, and great pains have been taken to make the appliance really a Thomas splint.

On examining the records of both the hospital and the out-patient department it was found that, since 1881, 21 cases of hip disease have been treated with this splint. No case has been intentionally omitted from this account, and some cases, therefore, with very meagre histories have been included.

No attempt has been made to choose cases for the splint, but it has been put on in all stages of the disease and kept on, in some cases throughout the course of the complaint, and in other cases till the interests of the patient demanded a change. Moreover, it has been used not only as a treatment for the disease, but also as a special remedy for some temporary condition of deformity. Patients were seen once a month or oftener, and were taken from the ordinary class of out-patient cases.

[1] Read by invitation.

	Age at beginning treatment.	Abscess.	Amount of permanent flexion.	Amount of abduction.	Amount of adduction.	Amount of motion.	Muscular spasm.	Real shortening.	Atrophy of thigh.	Atrophy of calf.	Elevation of trochanter above Nélaton's line.	In hospital for relief of deformity or pain.	From beginning of disease to application of splint.	Duration worn.	Reason for removal.
1	3	Present	?	0	Few degrees	Limited one-half in all directions.	Not marked.	3½ in.	3¾ in.	1¾ in.	1¼ in.	.....	?	8 yrs. 4 mos.	Still wore splint.
2	3	Present	0	0	10°	Ankylosis.	.....	1⅞ "	4½ "	¾ "	1½ "	.....	3 mos.	8 yrs.	Convalescence.
3	4	None	0	0	5	Limited ab't one-half.	Present	1¼ "	2⅜ "	½ "	1 "	.....	14 mos.	4 yrs.	Outgrew splint.
4	9	Present	20°	0	Few degrees	None.	Present	1 "	2½ "	1½ "	?	Present	18 mos.	3 yrs.	Splint did not fit and caused pain.
5	4½	None	30	Few degrees	0	Ankylosis.	.....	1½ "	1⅜ "	¼ "	1¼ in.	Present	34 mos.	2 yrs. 4 mos.	Splint broken.
6[1]	6	None	R. 20 L. 0	0	Few degrees	R. none limited; L. few degrees.	R. present L. present	1 "	1¾ "	½ "	0	Presen.	R. 9 mos. L. 4 mos.	2 yrs.	Outgrew splint.
7	6	Present	10	0	Few degrees	Few degrees.	Present	1½ "	swelling of thigh 3 in.	1 "	¾ in.	.....	12 mos.	21 mos.	Still wore sp.int.
8	8½	Present	Few degrees	0	Few degrees	Few degrees.	Present	1½ "		½ "	?	Present	2 mos.	17 mos.	Inconvenience of sitting in school with splint.
9	5½	None	0	0	0	Unlimited.	Absent	0 "	1¼ "	⅜ "	?	.....	12 mos.	16 mos.	Cure.
10	9½	None	?	?	?	Some.	?	?	?	?	?	.....	4 mos.	13 mos.	Patient tired of splint.
11	7½	Present	35	0	18	Few degrees.	Present	1¾ in.	4⅜ in.	1⅜ in.	much	.....	12 mos. or more	12 mos.	Outgrew splint.
12	6	Present	20	0	6	Ankylosis.	.....	1 "	2¼ "	¼ "	¾ in.	.....	Some months	9 mos.	Splint caused pain.
13	6	Present	30	Some	0	Few degrees.	Present	½ "	2¼ "	1¼ "	above	Present	1 mo.	9 mos.	Abscess and considerable flexion.
14	8	Present	27	0	13	Ankylosis.	.....	3¼ "	swelling of thigh	swelling of calf	2½ in.	Present	66 mos.	6 mos.	Splint caused great pain and was not helping.
15	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3 mos.	Abscess forming and patient not doing well on splint.
16	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2 mos.	?
17	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2 mos.	Patient refused to walk with splint. [2]
18	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 mo.	Splint failed to reduce deformity.
19	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 mo.	Cure.
20	Died shortly after application of splint.														
21	Has not been heard from.														

[1] Double hip disease.

[2] Changed for traction splint.

NOTE.—Nos. 7 and 14 had the hip excised before the application of the Thomas splint.
Nos. 4, 8, and 13, are now wearing a traction splint.
Nos. 2, 3, 5, 6, 10, 11, 12, and 14, are now going about with crutches and no splint.

Of the 21 cases satisfactory notes were found or have been obtained in 14, and notes sufficient to explain the use and the result of the splint in 5 more; one patient died shortly after the application, and one has not been heard from.

The results are given in the accompanying table, but before summing them up, it may be added that it has been found difficult to fit the splint, and difficult to keep the splint in place after it has been fitted.

From the table it is evident that of the fourteen patients whose histories are long enough to be valuable in estimation of the splint, nine had abscesses. At least nine had elevation of the trochanter above Nélaton's line. Eleven had shortening of an inch or more, and of these four had shortening of more than one and a half inches. Eight had atrophy of the thigh of more than two inches. Five had five degrees or more of adduction. Eight had some flexion. Six had no motion at the joint. Four had motion of only a few degrees. Three had a good amount of motion. One had perfect motion. Six were brought into the hospital for the correction of deformity or the relief of pain.

Finally, the character of results obtained is shown by the table to be, in a broad way, good position, with little flexion and adduction, but great shortening, great atrophy, and pretty constant elevation of the trochanter above Nélaton's line, with a percentage of abscesses remarkably large in comparison with that shown in the paper by Drs. Lovett and Goldthwait.

WHEN MAY TREATMENT BE DISPENSED WITH IN SPONDYLITIS?

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It is not the purpose of the writer to assume in this paper to answer the question of its title, but rather to suggest it as a subject on which some light might be thrown. It is something which as a matter of course presents itself sooner or later in the management of every case of spondylitis, and it is never easy to determine it in the mind of the surgeon, if he is careful—as he should be.

To the parents of the child with spondylitis it is a matter of concern, for often one of the first questions asked the surgeon is as to the time it will require to carry out the treatment.

No information can be gained by searching the contributions of those who have written especially in this department of surgery.

This is no doubt because it is generally believed that it is something to be settled wholly by the judgment of the surgeon in individual cases, and it cannot be so determined by any general rule. The latter proposition hardly admits of argument, but there is no reason but to believe that the long experience of many of those distinguished in orthopedic work could not, if given to the profession, be of some service to those of us who are puzzled at times in deciding whether we can safely dispense with support in these cases.

I think, from my limited experience, that as a general rule in these cases, the orthopedic surgeon uses the support too long, while the general surgeon takes it off too soon. Cases of spondylitis have come under my observation in which the appliance has been worn for years. In many if not most of these I was satisfied from the history and the condition of the spine that treatment might have long since

been safely dispensed with; and the subsequent good health and freedom from pain and any increase in the deformity justified the course pursued in removing the apparatus. On the other hand, I have at present under treatment three cases in which the jackets had been removed a few months before by the gentlemen in attendance on the cases. The children had been discharged as cured, but after a few weeks there were noticed in all of them pain, some increase in the kyphosis, and other symptoms which pointed unmistakably to an extension or an exacerbation of the disease. They have all been relieved by mechanical treatment. In one of these children, a typically tuberculous boy, the jacket had been discontinued after ten months' treatment.

Illustrations of this character may serve to draw attention to the importance of this point. It seems criminally careless to dispense with treatment in a case where disease is still present, and subject the patient to pain and the increase of a kyphosis the degree of which determines so much the strength and appearance, perhaps the life, of the individual. It can be safely stated that a slight increase in kyphosis which is already well marked means a great deal more—as regards the gait, the appearance and the growth of the patient—than the increase of kyphosis that is small; in other words an increase of a gibbosity originally one inch, implies more relative increase in a deformity than the same increase in one originally one-half inch. The surgeon should hesitate before he subjects his patient to any such risk.

In the class of cases in which mechanical treatment is kept up long after the disease is arrested the error is not so serious. The one great disadvantage in the mechanical treatment of spondylitis is the muscular atrophy of the body which follows the application of support, and it is well, perhaps, to say that this atrophy will be the more marked if the treatment is efficient—that the nearer perfect the support the greater the atrophy—for if it fulfils its purpose it puts at rest most of the muscles of the trunk. The atrophy is no doubt increased to some extent also by the direct pressure of the jacket or apron.

The other ill-effects from its long continued use are of minor, if any, importance. The muscular atrophy can be overcome after treatment is discontinued. It may be said that if all this is true,

why should we be anxious to get rid of the support, when it does no permanent harm and may possibly be of service where we cannot positively say that there is no longer disease. But I speak of cases where there is no sign of inflammation, in which the kyphosis has not increased in months, perhaps years, and in which the general condition of the child is improved; and when there is no disease, the indications for the use of support having disappeared, its continued application is harmful because it is no longer a necessity. It is then a burden—a foreign body and retards muscular growth and consequent improvement of the general health. Nature happily adapts the system to its use when it is needful, but is ready to discard it when it is no longer so.

The question then arises, When can it be safely done? As has been said, no rule can be laid down as to time, but some general observations might be made which may serve as an indication in some cases. Spondylitis may be found in two classes of subjects—those who are essentially tuberculous and those who are not; and in the latter class it is not proposed to say that the disease is not tuberculous, but that the subjects do not impress the observer as such, either in personal appearance or in family history. It is the belief of the writer that the course of the disease in most cases, and under any treatment, will be largely influenced by the constitutional type of the patient. If the child be a typically tuberculous one the course of the disease will, in all probability, be a slow, prolonged, one; while if it be not so, the disease may be limited in time and the case exceptionally rapid in its progress toward repair. This, it is believed, may be of some value in determining the point raised in this paper.

Another thing which must be taken into consideration is the amount of improvement gained in the general health of the child from the beginning of treatment. This may be throughout the course of the disease looked upon as reflecting in a great degree the efficiency or inefficiency of treatment. The general condition of the child will not improve if the disease progresses, and on the contrary it will certainly improve when the disease is arrested or cured.

The absence of pain in the abdominal region or anywhere else is not likely to be of any service in determining the question of arrest

or cure, for the reason that if the support be properly fitted the pain will wholly disappear; if it does not, there is something wrong in the treatment.

The progress of the kyphos, or more likely it is lack of progress, is a factor which is of value. If any recession has been gained and held for a considerable length of time, or if there has been an increase for months with a corresponding improvement in the general condition, there is much gained for determining this point. If there be found a compensatory depression just beneath the kyphos, such a fact was held by some of the older surgeons, notably the late Dr. Knight, of New York, to be almost indubitable evidence of the absence of disease. I have not seen this stated in any book, and have it only from tradition; but my observation has led me to attach considerable value to it, particularly in the dorsal region. I have observed it in the lumbar, where the acuteness of the inflammation was marked; but it is certainly found in many cases in the dorsal region, where disease formerly existed.

The matter of time is one that probably comes up before any other. It is impossible, of course, to lay down a rule as to how long the disease should be treated; but it may be safely stated that cases of dorsal disease that are unmistakably cured inside of a year are very exceptional. Cervical and lumbar disease generally require much less time for their cure—in fact, many of them are cured without treatment in a comparatively short time, and with fairly good results, for reasons which are obvious to all of us. Time alone, however, cannot settle the question; but it must be of much service by reason of the opportunity it gives for continued observation of some of the other points mentioned, and by virtue of the disease running an average course. In a case where it is believed that the disease is cured, it is much safer to begin the disuse of the appliance by slow stages, such as loosening it freely at night; and if no marked restlessness or pain follows, to discontinue it at night, or substitute for it a lighter dressing, such as a corset, which can be made by the mother, and the employment of massage, friction, and faradism, to develop the atrophic muscles, the original support being worn constantly through the day. If the child does not suffer any, attempts may be made to substitute the lighter support for an hour or two during the day. It must be remembered that the patient has been accus-

tomed to rely on a strong support for months, perhaps years, and therefore its discontinuance must be attempted by stages. In many cases, I am satisfied, there is no longer disease, but the support being abruptly taken off, the child is likely to suffer some pain, and a marked stoop due wholly to muscular weakness. With the apparatus removed, it should be watched as to how it conducts itself at play—as to whether it displays the same carefulness in movement present in the beginning of the disease or not.

By a consideration of some of these apparently trivial things we may be enabled to know when we can safely dispense with the mechanical treatment.

DISCUSSION.

Dr. A. B. Judson, of New York.—The question of removing the brace depends largely upon the region of the spine that is affected. In the middle dorsal region he believed that the antero-posterior pressure, which is concentrated near the projection by a properly made and firmly applied brace, is useful even after consolidation has taken place, because it improves the figure, especially of the growing patient, by transferring to the anterior part of the trunk a portion of the projection which would otherwise appear behind as an exaggerated boss. Patients treated in this way have a more prominent chest, but this is well borne if it implies a diminished kyphosis. In the upper dorsal, cervical, and lumbar regions these reasons lose their force, and he could see no reason why mechanical treatment should not be suspended as soon as consolidation is assured.

Dr. Benjamin Lee, of Philadelphia.—My own feeling has always been that it is better to err on the side of safety in these cases. A patient having become habituated to the use of a mechanical support is in no way inconvenienced by it; if it should be continued one or two or six months beyond the time of actual healing no injury is done. My practice is therefore to continue support some little time after I cease to feel that it is absolutely essential, and also to remove it not abruptly but gradually. I substitute for the absolute protection which I aim to give in the active stage of the disease a modified elastic form of support, which will prevent serious injury in case there should still be a lurking remnant of disease.

As has been stated by the reader and by others, the proper time for discontinuing mechanical support, will depend somewhat on the region

involved. The disinclination of the patient to give up the use of a jacket may mislead us, and thus it is sometimes worn for a greater length of time than is actually necessary. This, however, may not be a serious matter. The atrophy from long-continued use of supports is one of the sources of discomfort to the patient, but this can usually be remedied in a short time by proper measures.

Dr. A. J. Steele, of St. Louis.—Early in the acute stage of Pott's disease I use a plaster jacket, but very soon substitute for it a leather jacket, made light, and ventilated by perforated holes. It affords comfort to the patient, and is worn for a long time. The general improvement of the patient will be indicated in a measure by the manner in which the child carries itself; increasing in flesh, strength, and comfort, I begin to leave off the jacket at night. There is no harm done in thus taking off the superincumbent weight by lying. Apply the jacket again in the morning, and if is worn two or three months longer than is absolutely necessary there is no injury done. While we have atrophy of the muscles from long use of the brace or a jacket, it is a matter we do not particularly regard in Pott's disease. Let the application of the apparatus die away as the patient improves.

Dr. Reginald H. Sayre, of New York.—I agree in the main with all the ideas that have been brought out, except that in the upper dorsal region, as, for instance, the first and second vertebræ, if you have a case which has been cured with a moderate degree of kyphosis there, it seems to me very advisable to continue support of the head for a good while after the disease is arrested. Many of these cases have the misfortune to recover with deformity. The head then presses upon the trunk in an abnormal position, and the tendency is constantly to distort the vertebræ more and more, even those that are not diseased. They are forming themselves to whatever shape the child is held during the period of this growth. If you have a distortion there, I think that you prevent the increase of deformity in a marked measure by continuing the support of the head for a considerable period of time after the disease is apparently cured.

Dr. John C. Schapps, of Brooklyn, N. Y.—It is difficult to generalize on a paper of this kind, for each case must be treated on its own merits. The apparatus should always be removed tentatively and the case closely watched.

Dr. E. H. Bradford, of Boston.—There is one point that suggested itself to me, and which I think has not been referred to by any one. It is this: there are certain periods of danger in Pott's disease. Vogt has called attention to the periods of first and second dentition and the approach of puberty as times when there is danger of an increase

of rhachitic distortion. Whether this is true in a carious condition of bone I cannot say; but it seems to me that in case of a chronic disease, as caries of the spine, there is an especial danger of the patient after having once recovered apparently, to have a recurrence at the growing period near the time of puberty.

I have thought it advisable to keep on the apparatus at the time of puberty, even if I had reason to believe that there was complete consolidation, for the reason that when growth is rapid the bone tissue may be softer and more liable to reappearance of the disease.

Dr. Ryan.—I am very much pleased with the manner in which my paper was discussed. There has not been as much additional light thrown upon the subject as I had hoped. I think this is a question of great interest—at least it has been to me since I have been doing orthopedic work. We are commonly charged with not taking the brace off soon enough. I have seen cases of spondylitis treated for seven or eight years. I am satisfied there was consolidation in many in less than half of that time, but the appliance was still kept up. There is a great deal of atrophy going on, and it seems to me that in a patient who has tuberculosis of bone, the individual is predisposed to tuberculosis of the lung, and the best way to avoid it is to give exercise to that lung.

Some one remarked in the discussion that we cannot make a general rule for these cases—we must judge them individually; but, at the same time, I think that one of the sins of the orthopedic surgeon, so far as the treatment of spondylitis is concerned, is that he keeps up his treatment too long, keeping it up months and years when it is unnecessary. I believe there are many cases in which we can dispense with it after a comparatively short time. In the case of a typically tuberculous child we will have a slow case, which may last years and years; while in the case of a robust-looking child that develops spondylitis, the child may get well in eight or ten months, and it is absurd to keep the appliance up so long. I believe that there is a distinction to be made in these cases. In some cases we get consolidation in eight or ten months, while in others it requires a longer period of time.

There is a great deal in the after-treatment of Pott's disease. Take a child, for example, accustomed to a splint which produces more or less pressure, and which has been worn for months: there is much to be done here in developing the muscles of that child. We can bring about the growth of these muscles by means of massage, sponge baths, etc. There are a few cases which are greatly benefited by faradism. It seems to me that we should also pay a little more attention to the after-management of these cases than we are in the habit of doing.

A CASE OF FUNCTIONAL TORTICOLLIS, PROBABLY DUE TO DEFECTIVE EYESIGHT.

By ROBERT W. LOVETT, M.D.,
BOSTON.

John H., three years old, of excellent family history, was well until January, 1889, when it was noticed that he held his head to one side. No cause was to be assigned for it, and one or two neighbors had noticed before this that there was something peculiar about the manner of holding the head, so that it may be of longer standing. There was no pain at any time, and the condition was in every way excellent. With the exception of some serious digestive trouble at the age of one year the boy had always been well.

Examination in August, 1889, showed a healthy boy, well developed, and apparently sound in every respect. The head was held to the right, and could not be thoroughly replaced. There was no muscular spasm, but the head was held firmly against passive manipulation. The case presented every symptom of idiopathic torticollis. A marked internal strabismus was noted, and the boy was referred to Dr. F. E. Cheney to see if there was any ocular defect sufficient to explain the torticollis.

He reported finding chronic choroiditis of both eyes, with central choroidal changes in the right eye which were severe enough seriously to impair vision. The boy was operated upon, and the strabismus corrected, and in September he appeared with the torticollis much improved. The head was voluntarily held straighter, and his condition as he is shown to-day shows a very marked improvement over that of six weeks ago. No treatment other than that of the strabismus operation has been attempted.

Remarks by Dr. F. E. Cheney, of Boston.

Cases of torticollis, resulting from insufficiencies of the ocular muscles, are not common; or, at least, the condition has not often been

recognized. Dr. George T. Stevens, in an article on muscular insufficiencies, published in the *Archives of Ophthalmology* for June, 1887, speaks of the tendency of patients with insufficiency of the superior and inferior recti muscles to carry the head turned to one side. He also says: "In a certain proportion of these cases the contraction of the muscles of the neck becomes permanent, demanding for relief tenotomy of the tendons of the sterno-mastoid muscles, but in a much greater number the muscles of the neck will regain equilibrium, either speedily or after some time, when once the vicious ocular tendency is removed." Dr. Stevens has not, I think, reported any of his cases. Dr. Bradford reported a case at a previous meeting of this Society, and the same case was reported by Dr. O. F. Wadsworth at the last meeting of the American Ophthalmological Society. Beside this case, I believe, there has been but one other recorded. The resulting deformity in these cases of muscular insufficiency is due to the fact that the subject suffers from diplopia, and that the double vision can be corrected by turning the normal eye so that its visual axis is made parallel to the visual axis of the deviating eye. To give an illustration, we will suppose a patient, with a marked insufficiency of the rectus externus of the right eye, and as a result a converging strabismus of the eye and diplopia. If the left eye is now turned outward, so that its visual axis is made parallel to the visual axis of the right converging eye, the double vision will, of course, be corrected. If a patient wishes to see an object in front of him he must look directly forward with the left eye, and see double; or, what is better, he can keep both eyes turned to the left, at the same time turning the face toward the right shoulder, and see the object single. The turning of the face to the right, if continued for any length of time, would naturally result in more or less contraction of the muscles of the neck and a permanent torticollis.

Dr. Lovett's patient, a boy three years of age, was brought to me for examination August 5, 1889. The mother says that the face has turned to the right side for about six months, and also that the right eye has turned in at times during the same period. The turning of the head is not constant, but always takes place when the child looks steadily at an object. On examination I found a slight convergence of the right eye, and though it was impossible to determine in a child of this age that diplopia was present when the head was held upright, the history made it seem possible that the torticollis was dependent upon the ocular defect, and I did a tenotomy of the rectus internus of the right eye on the following day. Dr. Lovett examined the patient

one month after the operation and thought there had been some improvement in the position of the head. The improvement in a child of this age will naturally be more gradual than in an older child, who could be instructed to hold the head erect after the eye trouble had been remedied.

There is still a slight convergence of the right eye, and if possible I shall do another tenotomy of the rectus internus.

DISCUSSION.

Dr. Newton M. Shaffer, of New York.—I have seen muscular insufficiency in the eye associated with lateral curvature of the spine, torticollis, and non-deforming club-foot, and before believing that the case reported was due wholly to oculo-muscular insufficiency he would like to ask if the other muscles of the patient had been critically examined? It was not improbable that the same condition of insufficiency might be found in the cervical as well as in the ocular muscles—in the, more generally speaking, spinal muscles as well as in the post-tibial group.

Dr. E. H. Bradford, of Boston.—I have seen one case of oculo-muscular inequality with Dr. Wadsworth. This had been reported in the *Transactions*. I have seen another case where the deformity appeared to be due to the eye, but the child was young, and it was difficult to determine the condition of the other muscles. In the case reported a year ago the muscles in the rest of the body were perfect.

CONGENITAL ABSENCE OF FIVE RIBS, WITH RESULTING DEFORMITIES.

By HOMER GAGE, A.M., M.D.,
WORCESTER, MASS.

The subject of the following sketch was referred to me in May last by Dr. O. H. Everett, of Worcester, Mass. I have been unable to find any similar case in my own reading, and Dr. R. Lorini, of Washington, who has made at my request a very careful search, reports that he can find no reference to any like deformity in the library of the Surgeon-General's Office. I have thought, therefore, that these photographs,[1] with a brief sketch accompanying them, might prove of interest to you.

Susie S., born in Worcestershire, England, aged seventeen years and two months, is the oldest of nine children, none of whom present any peculiarities of growth or development. While pregnant her mother fell down stairs, injuring her side, but had never attached any significance to the injury. The absence of part of the bony wall of the thorax on the left side was noticed at birth. There was not, however, any curvature of the spine, nor was anything noticed with regard to the position of the heart. While she was yet a baby in long clothes, a little bunch was observed in the left side, which appeared only when she was coughing or crying, was about as large as a walnut, and seemed not unlike a rupture. She was carried daily to the hospital in the vicinity, where a bandage was applied to keep the bunch from coming out. These measures were, however, unsuccessful, and it gradually grew larger, attaining the present size about four or five years ago. The spinal curvature was first noticed when she was five or six years old, but received no treatment until four or five years later, when

[1] For the photographs I am under great obligations to Dr. E. V. Scribner, of Worcester. The lines indicating the position of the ribs and viscera were drawn upon the body with soft crayon.

plaster jackets were applied, and these four years ago were discarded in favor of a corset made of mill-board stiffened with fish glue. The corset has not provided any proper support for more than a year, and in consequence her curvature has increased very rapidly, and her general health has been very much impaired.

Fig. 1.

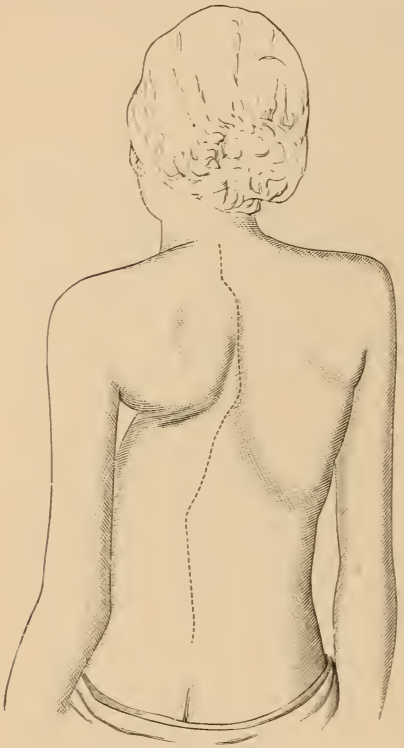
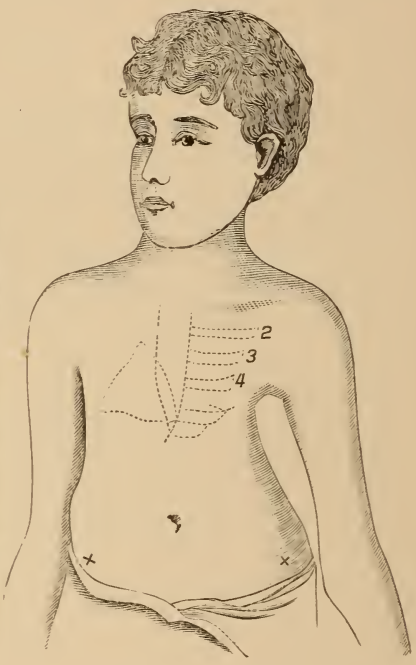


Fig. 2.



She has never had any serious illness, has met with no accident, and until within a year past has been obliged to assume, to a large extent, the work and responsibilities of the house. Since the jacket failed to afford an efficient support she has lost both flesh and strength, has complained of pain in the back and left side almost constantly, has lost her appetite, and has complained of great pain and distress after eating. She says that she can neither walk nor eat without pain. She has never menstruated. She is four feet one inch and a half tall, weighs seventy-two pounds, is pale and thin, breasts undeveloped, no signs of

puberty. She has a lateral curvature of the spine in the mid-dorsal region, with the convexity to the right, and a long compensatory lumbar curve. There is considerable horizontal rotation of the vertebræ, as indicated by the prominence of the angles of the ribs on the right side, but there is no corresponding prominence of the costal cartilages in front on the left. Upon inspection, the left side presents very much the appearance often observed after severe empyema, when the cavity has been closed by the retraction of the chest wall instead of by the expansion of the lung. But closer examination shows that the appear-

Fig. 3.

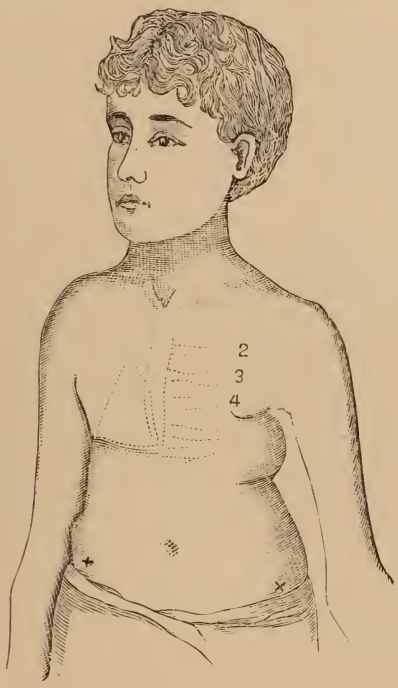
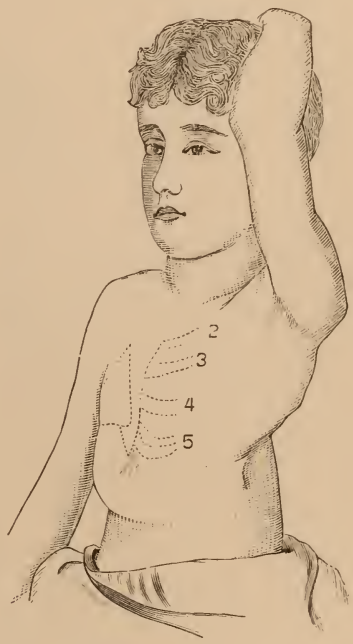


Fig. 4.

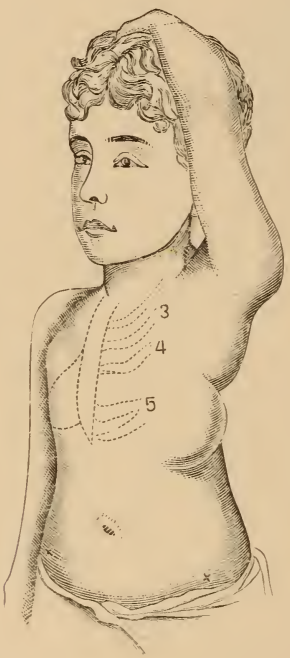


ance is due not to the retraction of the chest wall, but to the congenital defect in its development. As indicated in Fig. 2, the first, second, third, fourth, and fifth ribs are found in their natural positions and relations. Just below the fifth costal cartilage is a sixth cartilage which is connected with the end of the sternum and can be traced outward and upward until it joins the extremity of the fifth rib. There is no trace of the sixth, seventh, eighth, ninth, or tenth rib, and in the

gap thus left the muscular wall can easily be pushed in until the pulsations of the aorta can be felt from the side. In this gap, too, as is shown in Fig. 4, can be readily made out and felt the upper half of the spleen. Across the middle of the spleen can be felt the eleventh and twelfth ribs, smaller and in much closer proximity to each other than normally.

Pulmonary resonance and the respiratory sounds are lost below the border of the fifth rib in front and below the angle of the scapula behind. The area of cardiac dulness begins at the middle of the sternum, and extends to below the right nipple in the fifth interspace, as shown

Fig. 5.



in Figs 2 and 3. The first sound of the heart is heard loudest at this point, and the second sounds along the opposite side of the triangle. There is no murmur. Pulsation can be seen and felt all over this area, bnt more distinctly along what seems to be the basal line. Figs. 3 and 5 are instantaneous photographs taken while the girl was in the act of coughing, and afford a very accurate representation of the bunch to which I have already alluded. It cannot be produced or maintained

by any ordinary muscular effort, and subsides almost at once with the expiration which completes the cough. It has a firm, elastic feel, and as it is thrown out against the hand, gives a sensation exactly like the impulse of a hernia. Percussion over the whole area reveals a resonance decidedly stomachic in character. When once thrown out it can be partially held in position by the hands, and if at such times a little water is swallowed, it can be distinctly heard to fall into the stomach. Unless this bunch can be prevented from appearing by firm pressure of one sort or another, she says that she is in constant distress, which is aggravated by eating or drinking.

For her relief I applied a plaster jacket, from which I made a cast of the body from the axillæ to the trochanters. Upon this cast I had a leather corset moulded, and I endeavored to give it additional strength by incorporating four steel stays. She has worn this corset now for about two months with very satisfactory improvement. She has gained in flesh and strength, has a better appetite and better color, and is once more able to attend to her household duties.

Coexistent with these anomalies in the number of ribs there is very often, almost as a rule, a corresponding defect in the development of the vertebræ, as in the very remarkable case reported to the Royal Medical and Chirurgical Society by Willett and Walsham in 1880, in which five ribs on the right side, four on the left, and four and a half dorsal vertebræ were absent. There was a lateral curvature with convexity to the left which was believed to be due to the absence of the right half of the third dorsal vertebra. I feel very confident that in the case which I have just described there are twelve dorsal vertebræ. How many, if any, of them are imperfectly developed could be determined only by post-mortem dissection. Repeated and very careful examinations have, however, failed to give any evidence of asymmetry in their development. Moreover, I fail to see why such a supposition is necessary to explain the subsequent deformities. The absence of five ribs upon one side must cause a very serious disturbance in the arrangement of muscles and fasciæ. What has become in this particular case of the attachments of the serratus magnus, of the lumbo-sacral division of the erector spinæ, of the latissimus dorsi, and the great muscles of the abdominal wall, is of course impossible to determine; but, whatever their attachments may be, these muscles must work at a disadvantage as compared with

their fellows of the opposite side. In consequence thereof, as soon as the child began to assume the erect position the superincumbent weight of head and upper extremities was transmitted to a spinal column whose supports were seriously crippled on one side. The result has been the gradual development of a lateral curvature with its convexity toward that side whose supports were strongest.

The position of the heart on the right side is very much indeed like that observed in cases of left-sided pleurisy with large effusion, or in cases of left pneumothorax, and I am strongly inclined to the belief that it is the result of similar mechanical conditions. The left pleural cavity is diminished very much by the absence of so many ribs, and has been wholly occupied by the growth and expansion of the lung. In some way or other it seems to me that this growth and expansion of the lung with the sinking-in of that side of the thorax and the increasing lateral curvature have forced the pericardium and its contents to the right. The only alternative is to assume that the position is an anomaly of development, and that seems to me hardly necessary. A congenital displacement is usually associated with a general transposition of viscera, and that is certainly not true of this case.

There remains only the peculiar tumor which appears with the act of coughing. I have already indicated briefly my idea as to its probable nature, and will only add that the evidence obtained from its shape and position, from auscultation and percussion, and from the manner of its appearance, leaves in my mind no reasonable doubt that the tumor is a hernia of the stomach.

DISCUSSION.

Dr. De Forest Willard, of Philadelphia.—I have recently had the photograph of one case taken, but on account of being away from home for a month have not brought it with me. There is a difference in this case and the one reported by Dr. Gage, inasmuch as there is a longitudinal deformity of the thorax apparently from the absence of the anterior portion of the ribs upon the left side. The case is that of a girl twelve or thirteen years of age in whom no deformity was ever

noticed according to the testimony of the sister and mother of the child. There is no history of injury as far as I can learn, yet the deformity is so marked that it seemed astonishing that the parents could have passed it unnoticed. There is a deep furrow or depression outside the costal cartilages at their junction with the six upper ribs. Its depth had not been measured accurately, but would be scarcely filled by one's middle finger laid longitudinally. The lower ribs are not deformed.

SURGICAL OPERATIONS FOR THE RELIEF OF PRESSURE PARALYSIS IN CARIES OF THE SPINE.

By W. N. BULLARD, M.D., and H. L. BURRELL, M.D.,
BOSTON.

The advances in surgery, which have been so rapid and so extensive within the last few years, have at length reached a point where operations of a serious nature upon the spinal column, involving the removal of portions of several vertebræ and the opening of the spinal canal, may be performed with success, so far as the operation itself is concerned, and it now becomes the duty of the physician to be able to give, so far as is consistent with our present knowledge, an intelligent opinion in regard to the benefit likely to be derived from such operation in any given case, and the risks which are to be encountered apart from those of a purely surgical character.

We wish then to point out as distinctly as possible what cases of spinal caries are, in our opinion, suitable cases for operation, and on what factors we depend to form an opinion in any special case.

The symptoms for which operations on spinal caries have been undertaken are those of compression with or without irritation of the spinal cord, and the direct object of these operations has been the relief of pressure on the spinal cord. This compression is usually produced in caries of the vertebræ either by the collection and accumulation of inflammatory products between the dura mater and the bone and by the thickening of this latter membrane with an increase of fibrous or connective tissue formation, or by the direct pressure of displaced bone. The first cause is by far the most common. In a very large proportion of cases, it is probable that compression once produced does not materially diminish, and that the improvement in the symptoms, which so frequently occurs, is due principally to the

adaptation of the cord itself to its surroundings; in a smaller number of cases the compression may be more or less acute, and may diminish or disappear spontaneously. These latter cases are usually connected with abscess formation. Apart from the general condition of the patient and the ordinary surgical considerations, there are three elements especially to be weighed in determining the advisability of an operative procedure on the spine. First, the actual condition of the spinal cord; secondly, its prospects of recovery (of function), if not operated upon, under rest and other suitable treatment; thirdly, its prospect of recovery (of function) if the pressure be removed.

Actual Condition of the Cord.

The amount of injury suffered by the cord depends upon various factors, some more or less easily estimated, others extremely difficult to judge of. The principal ones are (1) the degree of pressure; (2) the time throughout which it has been exerted; (3) the liability of the cord to inflammation or degeneration.

Our means of determining the condition of the cord in general are well known, and we will only say that the symptoms to be principally relied upon are the loss of motion and of sensation and the condition of the reflexes below the diseased area. It is evident that the greater the loss of motion and sensation below the diseased point, the greater must be the obstruction to or the destruction of the cord conduction. If the inhibition or destruction of the conduction through the cord were proportional to the amount and duration of the compression, our problem would be much simplified. As it is, however, we have to deal with an indeterminate factor, the spreading of the disease in the cord. It is still a disputed question in what pathological form this extension of the disease ordinarily occurs, whether, as maintained by Strümpell, it is a degenerative process, or whether, as held by Gowers, it is inflammatory. However this may be, there is no doubt that, in addition to the ordinary spreading of the disease in certain cases, a spontaneous myelitis may occur, and the possibility of this must always be borne in mind.

Prospect of Recovery without an Operation.

The prospect of at least a partial recovery is, in the large majority of cases, especially in the earlier stage, a very good one. Even in

cases of total loss of motion and sensation, recovery, at least partial, may occur. Incontinence of urine and feces are very serious symptoms (Lauenstein's formula), yet we have seen both disappear after several months' duration and the patient become practically well. The duration of the symptoms is a most important element in the prognosis, though even this is not so determining as might at first seem probable. We all know cases in which paralysis has existed for years and which finally commenced to improve and recover motion and sensation. The recuperative power of the spinal cord, at least as regards function, is much greater than would be supposed *à priori.* The cases of caries of the spine are comparatively few in which, aside from causes dependent on the general health of the patient, it is not possible or even probable that some improvement in the symptoms directly referable to the cord will occur, if the active advance of the disease can be checked.

So long as we have reasonable or even moderate chances of recovery without operation, we do not believe it advisable or justifiable, in the present condition of spinal surgery, to perform so serious an operation as resection of the laminæ of the spinal vertebræ. This consideration at once reduces the proportion of these cases suitable for operation to a very small one, as we all know how prone these cases are to at least a partial recovery; on the other hand, when spontaneous recovery has become otherwise well nigh hopeless, this procedure offers us a prospect of success which should not be neglected. At present, it seems probable that this prospect is greater in the case of children than of adults.

Prospect of Recovery from Paraplegia and other Cord Symptoms by means of Operative Removal of Compression.

We have thus far been able to collect only eleven published cases in which an operation for the removal of compression has been performed upon the spinal cord, omitting Abbe's case, which, though counted by White, seems doubtful. (These are Macewen, five; Horsley, Duncan, Lane, Dercum and White, Wright, Thompson, each one.) To these we add our own case, making twelve in all.

Three cases (Macewen's) were successful, four were much bene-

fited, and some of these, notably Duncan's, should probably be classed as successful. One (Wright's) had recurrence of the former symptoms in two months. Four died, one in thirty hours, one in thirty-six hours, one in a week and one in a few months; the two latter of general tuberculosis.

Of these the age is given in only seven. Five were children under fourteen years of age. Two were adult males. Of the children one became well, three were at least much benefited, in one the symptoms recurred. Both the adults died of shock.

The results of these cases are, on the whole, favorable, and we are warranted in looking forward to much better ones as progress is made in surgical technique.

The principal contra-indication, beside the obvious ones existing in the general condition of the patient and his surroundings, is the presence of tuberculosis in some other portion of the body. In such cases the prognosis is necessarily serious, and the operation should not be attempted unless there exists some symptom thought to be due to pressure and immediately threatening life, as in the case of Thompson. Macewen's view that the presence of continued high temperature is of itself a contra-indication, aside from the possibility of its pointing to tubercular disease in other parts of the body, has not been borne out by later cases, notably by that of Lane, where, in spite of high temperature, the operation was successfully performed. The presence of an abscess is a contra-indication to resection if the pus can be evacuated in any other manner.

The occurrence of acute symptoms referable to the cord, other than those due to abscess, is not an indication for operation unless they appear to threaten life through compression of the cord. On the other hand, in many cases where acute symptoms occur we have to deal with processes in the cord which may not be specially aided by the removal of the compression, and where, again, there is a tendency to partial recovery. Thus a sudden paraplegia or increase of loss of motion or sensation is a contra-indication to immediate operation, though the time may come later when the operation will be desirable.

When, however, in any case the health of the patient is gradually failing, when cystitis is becoming chronic, and when obstinate bedsores are beginning to form without obvious cause in a case of some

standing, operation should be resorted to early in order that the chances may be in our favor.

To sum up in short:

Contra-indications: (1) General health and general surgical considerations; (2) The presence of tuberculosis in other parts of the body; (3) The presence of an abscess connected with the caries which can be otherwise evacuated; (4) Acute exacerbation of symptoms referable to the cord, and not threatening life.

Indications in favor of an operation are: (1) General good condition and favorable surroundings; (a) when the disease is gradually and slowly progressing to an unfavorable termination; (b) when the patient has more or less complete loss of motion and sensation in the portions of the body below the level of the lesion, and incontinence of urine and feces, and where these conditions have lasted for a sufficient length of time to render spontaneous recovery improbable, and not so long as to have produced permanent destruction of all recuperative power in the cord. (2) Where acute symptoms threatening life appear, and where there is reasonable expectation that they may be relieved by the removal of compression.

We now come to the consideration of our own special case.

The patient, a strong butcher, forty-six years old, a native of Ireland, entered the Carney Hospital on the 29th of December, 1888, in the service of Dr. V. Y. Bowditch. His family history was good and he himself had never been ill previous to his present trouble. About three months ago, he began to suffer from pains in the back, sides and abdomen, and from a sensation of constriction around the body. Three weeks ago the pain extended to his lower extremities, they became weak and he was unable to walk without assistance.

December 30. To day an examination of the patient was made by Dr. Bullard at the request of Dr. Bowditch, as follows: Patient well developed and in excellent condition as regards general health. Nothing abnormal detected about head, face, chest, upper extremities, or in any of the internal organs. Distinct prominence in the back, involving the fourth, fifth and sixth dorsal vertebræ, and over these there is some tenderness. There is a decided weakness of both lower extremities, but he can walk with the aid of a stick. Sensation is somewhat diminished everywhere in front below the seventh intercostal spaces; behind there is decided diminution below the level of the

lower dorsal vertebra and slight diminution up to the level of the sixth dorsal. Thoracic reflexes normal as low as sixth or seventh ribs, below this and over the abdomen the superficial reflexes are diminished. Over the back they are more marked in the upper portion than below, and are not marked over the glutei. Cremasteric reflexes slight; plantar cannot be obtained; triceps reflexes not remarkable. Knee-jerks much increased on both sides. Paradoxical contraction obtained on both sides, left more marked than right (this disappeared in a day or so).

February 1. From change of service the patient enters to-day under the care of Dr. Bullard. Has grown steadily worse since entrance. Paraplegia increasing, some difficulty in micturition and considerable pain.

6*th.* Complete paraplegia. Sensation as before.

19*th.* The question of operation has been considered, but it has been decided to place the patient on a Bradford frame.

March 1. Not comfortable on frame. Girdle pains very severe.

15*th.* Removed from frame. Very serious bed-sores. Has been in great pain most of the time, partially relieved by morphine.

May 13. Patient growing rapidly worse, bed-sores increasing, and pain being intolerable. General condition has been rapidly failing, and is now poor. For the last fortnight every means has been used to improve his general condition.

Transferred to care of Dr. Burrell. (Patient was seen by Dr. Burrell, in consultation, for the first time in February, and several times later. For more than a fortnight before his actual transfer, he was practically under his care.)

On May 14, 1889, the condition of the patient was truly pitiable. He was suffering intense pain, which morphine could hardly make bearable; he had a large bed-sore, which exposed the sacrum and which extended onto either buttock. Sloughs had already occurred at various points on the heels and over the heads of the fibulæ. Cystitis existed in a marked form. The patient urgently begged for some relief to his condition, and the uncertainties of the success of the operative procedure having been explained to him, it was undertaken.

The patient was etherized and an incision was made in each vertebral groove extending from the second to the seventh dorsal vertebra; these incisions were carried down to the laminæ. Considerable oozing of blood ensued, which was arrested by sponge pressure. A transverse incision was made uniting the two incisions in the vertebral grooves, just below the spine of the fifth dorsal vertebra. This made

an H incision. Two flaps were raised from the laminæ and the spinous processes by means of a heavy knife and scissors, and thus were made musculo-cutaneous flaps which were reflected upward and downward; then by means of a Bonwell surgical engine, which was run at a slow rate of speed, the laminæ of the third, fourth, fifth and sixth dorsal vertebræ were divided. Unfortunately the engine, the saw of which was kept constantly wet by a stream of water, broke down when the laminæ were two-thirds divided, and the operation had to be completed by the aid of an osteotome. The osteotome was then driven in directly over the spinous process of the second dorsal vertebra, breaking off its overhanging point. A separation was accomplished between the spines of the sixth and seventh dorsal vertebræ by means of a knife and scissors; this allowed the block of the spines and laminæ of the third, fourth, fifth, and sixth dorsal vertebræ to be raised up, hingeing at the divided point of the spine of the second dorsal vertebra. The turning up of this block of spines and laminæ was not directly upward, but it was thrown a little to the right. This allowed a full, free exposure of the cord, which was seen in the bottom of the wound, seemingly normal in appearance, except opposite the fifth dorsal vertebra, where it was perceptibly flattened and did not pulsate. The veins of the cord were somewhat congested. The cavity was irrigated, and a small roughened portion of the lamina of the sixth dorsal vertebra was removed. The block of the spines and laminæ was turned down into position, and held by sutures to the adjacent muscular structure. Wound closed with catgut sutures, and dressed with baked gauze. Time of operation one hour and forty five minutes.

The hemorrhage, which we expected would be quite severe, was easily controlled; it was not greater in amount than usually occurs in a breast amputation and a clearing out of the axillary contents.

At the completion of the operation the patient was very cyanotic, and breathing was somewhat difficult. Stimulation was resorted to with partial success. The patient was put to bed reclining in prone position. Patient continued to improve very slowly throughout the day, and six hours after the operation took brandy per mouth; pulse very rapid and feeble. Eight hours after operation patient was placed in a recumbent dorsal posture, and soon fell asleep. Respiration 36, pulse 144. Twenty-four hours after the operation it was noticed that he breathed with more difficulty and took less nourishment. Thirty-six hours after the operation the patient became cyanosed, his respiration became shallow, and he died of shock.

In commenting on this case we would say that it was undertaken as an experimental effort, with the distinct understanding with the patient that such was the case; and we both feel confident that had it been undertaken at an earlier period in the patient's illness, and at a time when his recuperative powers were stronger, it would not have ended fatally.

Dawbarn (*New York Medical Journal*, June 29) has reported a case where he resected for traumatic paraplegia. His operation occurred on December 20, 1888, and from his description we should judge that he attempted the same operative procedure that was undertaken in our case. His patient recovered, and some slight improvement in the symptoms ensued.

One of the advantages of the operation of "resection and reimplantation" is, that it lays bare a given portion of the spinal cord and restores the bony structures with a possibility, at least, of their reuniting; but at present, if we were asked to undertake this operation, we should decline, and should resort to the use of a trephine and bone-cutting forceps for the removal of the laminæ.

The key to the success of any operative procedure on the spine will be the securing of an efficient means for dividing the bony structures with ease, speed, and accuracy.

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DISCUSSION.

Dr. Burrell.—There are one or two points that should be strongly emphasized. The difficulties of the operation speak for themselves. It took one hour and forty-five minutes to do the operation. The hemorrhage was not severe. The important thing for this operation is the use of an instrument which can be applied to divide the laminæ with accuracy and rapidity.

Dr. De Forest Willard, of Philadelphia.—The question of laminæctomy is in its experimental stage. We have the records of only a few brilliant results. Macewen and Horsley have relieved a certain class of cases which were absolutely hopeless under any other form of treatment.

I have no criticism to offer on the paper that has been read, except to call attention to the length of time which this individual had been diseased. If I remember the history correctly—although the symptoms were exceedingly serious—the length of time was only a few months. Possibly strong extension and counter-extension upon the spinal column might have assisted the pressure paralysis. It is a question also whether upon the water bed or in the prone position some benefit might not have been obtained in healing the bedsores, yet it was evidently one of those desperate cases in which almost anything seems justifiable.

So far as division of the laminæ, with a pair of forceps such as were used in this case, I should say that the lower blade was thicker than necessary and might injure the cord. The forceps we use in Philadelphia for this purpose are the Hopkins *rongeurs*, with flat lower blade, and cutting upper one.

I think the conclusions the doctor has given us are good. It is an experimental operation, and in a few cases good results have been obtained; but, ordinarily, I think it ought not to be attempted until other means have been exhausted, or when the condition of paralysis is increasing, and where there is imminent danger of death. I do not think the results thus far have been sufficient to warrant us in performing such an operation except in well-selected cases. I have had several cases under my care during the last twelve months in which I have looked forward to doing this operation, but under extension and counter-extension they improved so rapidly that I felt it would be absolutely unjustifiable to attempt it.

Dr. John Ridlon, of New York, asked whether the dura was opened, to which Dr. Bullard replied it was.

Dr. E. H. Bradford, of Boston.—I would state that this summer I had the pleasure of meeting Mr. Horsley, of London, who was kind enough to show me a number of cases upon which he had made the operation of trephining the spine. Beside this case Dr. Bullard has included in his series, he has operated upon several others. He has had no bad results in any of them. I think the first case in which there was a cure was that of a child, and it is a question whether the cure or recovery from the paralysis would have taken place without operation. His method is to cut down upon them, seize the laminæ, then put in a large trephine making a hole such as you have seen here, the laminætome cutting here (illustrating), and the trephine cutting a larger hole. He does not open the dura, and avoids it entirely. He has no trouble with the wound in the after-treatment.

I had an opportunity to see five cases shortly after the operation, but sufficient time had not elapsed for their improvement and recovery. They were all adults; all severe cases. Mr. Horsley told me there were three cases in which he had found broken-down caseous matter within the canal which would exert pressure.

Dr. Charles C. Foster, of Cambridge, Mass.—Cases of pressure paralysis of the spine, even in adults, sometimes get well. He reported a case in a man of twenty-eight which recovered after eleven months' treatment by extension.

Dr. Bullard.—There is one point mentioned by Dr. Willard on which I would like to speak, and that is with reference to extension and counter-extension. No one feels more strongly than I the value of the conservative treatment, and I believe that in all suitable cases counter-extension should be tried. This case, however, was not a suitable one. The extreme pain and the very rapid progress of the disease combined with the general condition of the patient render counter-extension impracticable.

THE TREATMENT OF PES EQUINO-VARUS BY CONTINUOUS LEVERAGE.

By HENRY LING TAYLOR, M.D.,
NEW YORK.

In congenital equino-varus we probably have the result of arrested development of the foot, whether due as Dr. H. W. Berg[1] believes to failure of the thigh to rotate in or to other causes. In this well-known deformity the heel is drawn upward and inward, and the foot is bent inward upon itself, and rotated toward the internal malleolus. These elements are present in varying degree in the different cases. Anatomical and clinical observation have shown that all the tissues, and not the muscles alone, are shortened and compressed on the concave side, lengthened and expanded on the convex side. The bony and ligamentous structures especially are shortened, narrowed, wedged, or displaced as compared to the normal foot, because growth has taken place in an abnormal position. In some specimens which have been examined it is noted that deformity persisted after all the tendons had been cut.[2]

It is thus apparent that the problem presented is to remould the foot, by artificially supplying the forces which are deficient. When contracted and compressed regions are relieved of pressure by the stretching process, their growth will be stimulated toward the natural relation of the parts.

Looking at such a deformed foot from behind we see that the foot and leg taken together present an irregular curve with the convexity outward. If we are to attempt to reduce this curve it is mechanically advantageous to place our splint, which may be straight from

[1] Archives of Medicine, New York, December, 1882.

[2] Dr. C. L. Scudder, Boston Medical and Surgical Journal, October 27, 1887, Cases II. and III.

below the knee to the toes, on the inner side of the leg and foot and draw them to it by strapping. This is better than putting the splint on the outer side, because in the former case we have good contact at each end to steady our splint while we are drawing the ankle in, while in the other by any method of strapping the distance between the points of firm contact is much shorter, and the apparatus consequently less fixed.

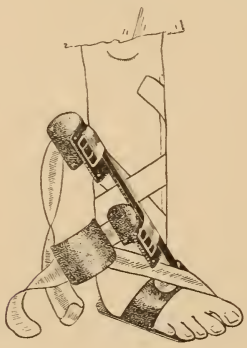
Dr. C. Fayette Taylor, when he first b-gan to treat club-foot in 1858 or 1859, saw the mechanical advantage of placing the splint on the inner side of the foot and leg and has used that method ever since. His early apparatus consisted of a leg-piece and foot-piece pivoted at the ankle, and so arranged that the foot-piece could be set at any angle; a sole plate was soon added. In the beginning if there was much equinus the foot-piece was set with the toe-end dropping so as to make an almost straight splint with the leg-piece; the splint was gradually bent at the shank to rotate the foot out; the tendo-Achillis was stretched, and flexion of the ankle was progressively carried on by flexing the foot-piece of the splint and retaining it by a screw. After the foot was everted and flexed its position was kept by wearing the appliance inside the shoe as a retaining apparatus. The brace was not attached to the shoe, for any attempt to utilize the shoe to hold the foot is disappointing, as it has no precise grasp, and the foot slips and turns inside. In 1867 Dr. Taylor visited many European clinics, among them Mr. Smith's, at the Hospital for Sick Children, Great Ormond St., London. He found him treating club-foot by bandaging a straight piece of zinc to the inner side of the foot and leg, *having first brought the foot into complete extension*, so that it formed a straight line with the leg. As the foot yielded outward he bent the zinc with his hands to force it still further over and kept this up until he got an equino-valgus, the lateral deformity being over-corrected; he then cut the tendo-Achillis and flexed the foot. Mr. Smith was not an orthopedist, but my father speaks with admiration of the precision of his mechanical sense and the excellence of his work, and acknowledges his indebtedness to him for the idea of first overcoming the varus before attacking the equinus, which he has adopted and practised ever since. Mr. Smith insisted on the advantage of preserving the tendo-Achillis as a counter-force to assist in stretching the plantar ligaments and the

structures on the inner side of the foot. The tendon steadies the heel while the forward part of the foot is pushed over, and the plantar ligaments are stretched from the inner side fibre by fibre.

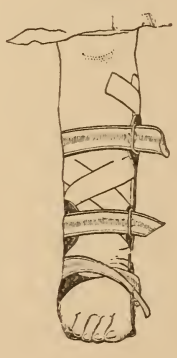
Up to this time Dr. Taylor had employed tenotomy freely as a step in mechanical treatment, but after adopting the method of first reducing the varus separately, he found that the resistance of the heel cord was so much lessened by the process that it yielded to the mechanical means employed much more readily than under the old plan of reducing both deformities at once, and for the same reason as in the case of the plantar fascia and ligaments. In equino-varus the tendo-Achillis is inserted toward the inner side of the tuberosity of the os calcis and the inner border of the tendon is shorter than the outer; by forcing the foot out and the os calcis over, it is stretched fibre by fibre as when we tear a bandage from the tense edge, and when the valgus position is established the resistance is diminished. The process is analogous to that employed in the treatment of combined adduction and flexion in hip disease. The adduction is first overcome separately and then flexion is found to be much lessened.

The splint always acting from the inner side and never attached to the shoe continued to be used and modified to meet the requirements of particular cases, and has been substantially as I show it for

Fig. 1,



Fig, 2.



fifteen years or more. It consists in its commonest form (Figs. 1, 2, and 4), in a steel shank with guarded leg and ankle bands pivoted to a foot-piece of thin steel. The foot-piece has a sole plate, and a

side-plate fitted to the inner side of the foot; there is a screw-stop at the ankle-joint to flex the ankle, and there are straps across the instep which are guarded by a small steel bar. The shank is not usually pivoted directly to the foot-plate but to a steel H-piece, which makes an offset from the ankle. The shank of this instrument is easily bent by the band or by wrenches, according to the requirements of the case.

About 1874 he began to apply a three-tailed adhesive plaster to the leg; a piece of webbing attached to the plaster was buckled to the heel of the apparatus (Figs. 3 and 4). This kept the heel from leaving the sole-plate when force was applied, and greatly increased precision. As the mechanical means became perfected tenotomy was found less and less useful even in cases of long standing, or in

Fig. 3.

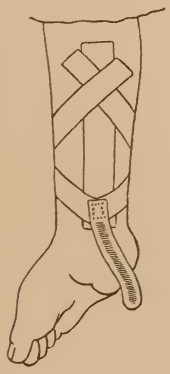
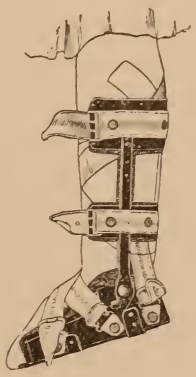


Fig. 4.



those that had relapsed after tenotomy, from imperfect mechanical treatment. It was usually found advantageous to preserve the heel tendon as an aid in unfolding the contracted tissues on the bottom and inner side of the foot, and it and the other contracted muscles readily yielded to stretching when force was properly applied and in the proper order. There is no objection to tenotomy when it is done with a clear idea of its purpose and limitations, but it cannot be made to usurp the place of systematic mechanical treatment. Much disappointment has been caused by failure to realize that it is only an incident in the treatment of club-foot. After successful tenotomy there is still ligamentous and bony resistance to replacement, which

even if for the moment overcome by force, will in time drag the foot back into a deformed position unless mechanical means are used to prevent it, and to hold the foot in position until the hard and soft tissues are remoulded and in equilibrium on the two sides. In other words whether tenotomy is used or not, mechanical treatment is indispensable. As a prominent German surgeon, himself a believer in preliminary tenotomy, said to me a couple of years ago: "We in Germany have known for twenty years that tenotomy does not cure club-foot." It is the means employed after the operation that mould the foot into position and retain it, and whether or not a permanent cure is effected will depend upon the efficiency of the after-treatment rather than upon the thoroughness of the tenotomy.

After applying the three-tailed plaster to the inner side of the leg in the manner shown, the foot-piece of the apparatus is securely strapped to the foot, and the plaster-webbing buckled to the heel of the splint (Fig. 1); using the shank of the instrument now as a lever the foot is thrown out and the leg-plate of the apparatus is strapped in place (Fig. 2). All straps are so placed and guarded that there is no circular constriction of the limb, even after continuous use. The apparatus is, of course, properly padded, and is removed at least twice a day at first to bathe the foot and make necessary modifications. The shank of the splint is gradually bent, forcing the foot over toward the valgus position. As the forward part of the foot swings outward the original curve of the leg and foot becomes divided into two curves by the displaced heel; the upper formed by the heel with the tibia, the lower by the heel with the metatarsus. These are in turn directly attacked by our apparatus, thus pushing the foot out and over in the same manner as in the original curve, the inner side of the os calcis being added to the ball of the great toe and inner aspect of the upper end of the tibia as a fixed point of mechanical action, the convexity of the upper curve being drawn to the splint by a strap just above the ankle, that of the lower one by a strap over the cuboid and mediotarsal region.

With this leverage, and padding over the inner side of the heel, if necessary to increase its force, the os calcis and heel swing over into place.

The position of the os calcis is the key to the situation, and it is not able to resist this direct attack. In fact, it is necessary to be

somewhat cautious not to force it too far over, and leave the patient with a permanent valgus.

When the os calcis has been brought into proper position, and the deformity has been changed to an equino-valgus, the ankle is flexed by turning the set-screw at the ankle-joint, the heel being prevented from rising by the plaster. During the few weeks that all this is going on, it is important that the patient should not put his weight on his foot, as this throws much unnecessary strain on the plaster. When he can place the sole flat on the floor walking in the splint will assist rather than hinder.

The apparatus must be worn day and night throughout the treatment, so that the foot may never return to the deformed position, and the contracted tissues may always be on the stretch. This moderate continuous stretching is irresistible, and is easily borne by the patient. During the prolonged after-treatment the patient is seen only occasionally, and goes about quite independently in his brace, which is completely concealed by his shoe and stocking. When the tissues of the foot are remoulded, and stable in their corrected position, all treatment may be discontinued, though it is sometimes better to have the splint worn at night for a time.

The above comprise the essential principles in ordinary cases, but details vary so that each case, from beginning to end, is a separate study, and our means must be modified and adapted to suit each individual. We use many forms of foot-brace to suit the peculiarities of the case in hand, but always, for varus, retain the principle of stretching or moulding by continuous leverage from the inner side of the leg or foot.

Sometimes it is an advantage to run the brace up above the knee in order to get a better purchase on the foot. Once in a while there will be a residual inversion of the thigh or at the knee after the foot deformity has been corrected. This requires a long apparatus, with free knee-joint and hip-band, to evert the thigh. Each mechanical indication must be carefully met as the case progresses.

The acquired varus of infantile paralysis is treated on similar principles, due regard being had in the construction of our apparatus to the condition of the opposing muscles, and of the rest of the limb. Tenotomy is seldom required. In the deformity due to spastic and

cerebral palsies tenotomy is more often useful along with mechanical treatment.

The following outlines will give an idea of the results that can be attained by the employment of continuous leverage alone, even after failure with the ordinary methods.

Case I.—A girl aged five and a half, came to me from Montreal in March, 1883. She was born with an equino-varus of the right foot and the heel-cord and one other tendon had been cut by a surgeon at six months, and the tenotomy of the heel-cord had been repeated at ten months. The foot had been put up in plaster and she had had manipulation. At two and a half years she could place the sole on the floor and had begun to walk; from that time till seen she had worn a club-foot shoe. For a year and a half the foot had been rolling over and growing worse; the father stated that it was then (1883) worse than it had ever been.

Examination showed that she walked on a large corn over the cuboid bone turning the foot in (Fig. 5). There was considerable rigidity and the foot could not be brought into possession by manipulation.

Continuous leverage was applied and the patient was able to walk on the sole in two weeks, wearing the apparatus. The foot gained three-quarters of an inch in length and the patient walked about with

Fig. 5.

Fig. 6.

the shoe over the brace, stepping squarely on the sole of the foot, in a month. She continued under treatment two years, and was shown cured at the New York Orthopedic Society, April 30, 1885 (Fig. 6, November, 1884). Since then she has been walking about freely without support, but has worn the brace at night to prevent relapse.

She presents the unusual feature of three-quarters of an inch shortening from retardation of growth in the previously affected leg.

Case II.—Girl, five years, Montreal. Brought September 21, 1885. Congenital talipes equino-varus, severe, of left foot. Heel-cord cut at three months; gutta-percha splint till ten months; tenotomy of tendo-Achillis repeated then and foot put up in plaster. Scarpa's shoe nine months thereafter. Patient learned to walk at nineteen months in ordinary shoe with foot in deformed position. From two years to four and a half, brace with hip-band. Father states that she has not improved at all since ten months of age.

Examination showed patient walked on corn over cuboid bone, the foot pointing in. The distal phalanges on right foot are missing and the remaining ones webbed (Fig. 7).

Fig. 7.

Fig. 8.

Foot came around readily under continuous leverage; patient was walking readily flat upon sole in a few months and was discharged from treatment with deformity cured in two and a half years. She walks flat on foot, turns toe out and ankle can be flexed beyond right angle (Fig. 8, October, 1886).

Case III.—Boy, four years, Connecticut, came in February, 1877. Severe case of double congenital equino-varus. Seven tenotomies at four operations, between third and sixth month; case reported cured with photographs (Fig. 9 at two months, and Fig. 10 at fourteen months). An earnest attempt was made to hold the feet by mechanical means, but in spite of many kinds of appliances and repeated tenotomies the feet relapsed. There were altogether eleven etheriza-

tions and seventeen tenotomies before the case was brought to Dr. C. Fayette Taylor, at the age of four. He then presented a severe and typical varus with great rigidity; the feet could not be straightened

Fig. 9.

Fig. 10.

by manual force (Fig. 11). Treatment by continuous leverage was used and the deformity was corrected. The figure (Fig. 12) shows their condition in June, 1878. He wore retention apparatus several years, walking about freely, flat on his soles.

Fig. 11.

Fig. 12.

He was shown at the New York Orthopedic Society, April 30, 1885, walking perfectly flat on the soles of his feet and turning toes out. There was limited motion at the ankle, but the feet were of normal shape. He had not worn braces for three years.

Since then as flexion seemed somewhat diminished, I advised him to wear braces at night to keep the toes from dropping. He has done so, and his feet were, when last seen, some two years ago, perfect in shape and function, except for the limited ankle motion.

I advocate the method of progressive remoulding of the foot by continuous protected leverage to correct the faulty moulding of nature, on account of—its certainty; the directness and precision with which it meets the indications; its freedom from discomfort to and restriction of the patient; the perfection and permanency of its ultimate results.

The treatment of pes equino-varus is neither a question of braces nor of tenotomy, but of exact apprehension of the indications presented by each case throughout its progress, based upon a critical analysis of the elements involved. As M. Delore suggestively remarks:[1] "You must convince yourself it is the surgeon and not the apparatus that effects the correction."

I emphasize as important practical points:

1. The preservation of the heel-cord as an aid in unfolding the foot.

2. Exact prehension of the foot by means of an apparatus not attached to the shoe, and by plaster applied to the leg.

3. The application of leverage to the inner side of the foot and leg.

4. The reduction first of the varus deformity, afterward of the equinus.

5. Thorough after-treatment.

[1] Du Torticolis, etc. Gazette Hebdom., March, 1878, p. 168.

ACUTE ARTHRITIS OF INFANTS.

By W. R. TOWNSEND, A.M., M.D.,
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Among the many acute diseases of bones, probably none has attracted more attention of late years than osteomyelitis. This is largely due to the fact that with our advanced knowledge of bacteriology many points in its etiology and causation has been cleared up, and at the same time our methods of treatment are more scientific and accurate.

Acute arthritis of infants is a disease which may properly be described under the acute infectious processes of bone. The term was first used by Jules Teilhard La Terrisse in his thesis presented to the Faculty of Medicine of Paris for the degree of doctor of medicine,[1] in 1833. He reports three cases in children of three, six, and nine days respectively, and on autopsy in each case found pus in several of the joints. In one case there were also several abscesses in the lung. He believes the joint collections of pus were metastatic, and says that M. Dance, in an article on phlebitis, has cited similar cases.

In 1874, Mr. T. Smith, surgeon to St. Bartholomew's Hospital, describes the affection and reports twenty-one cases under the name "Acute Arthritis of Infants."[2] Barwell, in his treatise on diseases of the joints, describes the disease under consideration as "Peracute Articular Ostitis," and also employs the term epiphysitis.[3] Klose, from the frequent separation of the epiphysis from the rest of the bone, was induced to describe it as "Epiphysentrenung," and also meningo-

[1] Observations d'Arthritis aiguës chez l'Enfant nouveau-né, etc. Thèse, etc., 1833.

[2] Acute Arthritis of Infants, by T. Smith. St. Bartholomew's Hospital Reports, 1874, vol. x.

[3] A Treatise on Diseases of the Joints, by Richard Barwell. American edition, 1881.

osteo-phlebitis.[1] Chassaignac, Demme, Lannelongue, and others have described it as osteomyelitis. Krause, in an article on "Acute Purulent Synovitis in Infants," describes it, and says that Volkmann has seen some fifty cases[2] and that he calls it "Catarrhal Inflammation of Joints in Infants." He did not believe that other diseases acted as exciting causes, and most of his cases terminated favorably. He found a coccus resembling the staphylococcus pyogenes of Rosenbach, and the diphtheritic coccus of Löffler. Stromeyer, in a memoir on "Osteitis Articularis Peracuta," speaks of it, and it is from him that Barwell takes his definitions and terms. MacNamara, in the first edition of his work, writes of "Acute Epiphysitis," but in the later edition,[3] owing to the fact that exception has been taken to the term "epiphysitis" as applied to the disease we are considering, calls it "suppurative osteitis in growing bone," and as synonyms gives "acute osteitis of childhood, suppurative periostitis, juxta-epiphysial osteitis, acute necrosis of childhood, and osteomyelitis during growth of bones"—these are in addition to some of the various names we have already considered. Thomas Jones,[4] in his work on diseases of the bones, does not give a separate chapter to acute arthritis of infants, but treats of it under "Acute Osteomyelitis," and under "Necrosis of Epiphyses and of Articular Extremities of Bones." Among the earlier writers quite a confusion exists as to names. Schutzenberger, in 1853, wrote on "Rheumatic Periostitis; Chassaignac, in 1854, on "Acute Sub-periosteal Abscess;" Becker, in 1858, on "Phlegmonous Periostitis;" Garnett, in 1862, on "Juxta-epiphysial Osteoperiostitis," Giraldès on "Phlegmonous Periostitis," and Huber on "Arthritis Suppurativa Multiplex Rheumatica bei Kinde."

As the earlier authors endeavored by the terms used to describe the disease, so the term acute arthritis of infants, which was first used by Terrisse, and then brought into prominence by Smith, seems to meet the requirements more fully than the others, should be retained, I think.

In considering the question of disease affecting the articular ends

[1] Präger Vierteljahrschrift, 1858, Klose.

[2] Berliner klinische Wochenschrift, 1884, No. 43, Krause.

[3] Diseases of Bones and Joints, by C. N. MacNamara. London, third edition, 1887.

[4] Diseases of the Bones, by Thomas Jones. London, 1887.

of long bones in infants, it is necessary that we recall certain differences in those structures as compared with the conditions which exist in later life.

Mr. MacNamara, on the subject of "epiphysial cartilage," says: "During early life, while the temporary cartilage is becoming calcified, and subsequently replaced by bone, the epiphyses remain unossified. The epiphysial cartilages increase in all directions by interstitial growth. The bones increase in length by means of ossification at that part of the epiphysial cartilage which is in proximity with the diaphysis.

"Osseous tissue is in the epiphyses, as in the diaphyses, preceded by calcification of the cartilage; then the production of osteoblasts, the removal of the cartilage matrix, and development of bone. In the epiphyses, however, the process of ossification commences in the centre of the cartilage and advances from within outward; a disk of cartilage ultimately separating the osseous structure of the diaphysis from that of the epiphysis. . . . .

"But after the ossification of this cartilage is completed—that is, from adult life onward—the space which the epiphysial cartilage previously occupied is represented by a line of osseous tissue which can be demonstrated, and which separates the longitudinal system of lamellæ of the epiphysis from that of the diaphysis. The circulation of the blood is carried on unequally in these different parts of the bone, the epiphyses being the least vascular part of a fully formed bone.

"In early life the line of newly formed bone which is in proximity with the diaphysial side of the epiphysial cartilage, is extremely vascular. Not only do numerous vessels penetrate this part from the diaphysis, but there is a venous plexus surrounding the bone in this situation. However carefully we inject a full-grown fœtus, it is difficult to prevent the extravasation of the injection into the tissues immediately surrounding the junction of the diaphysis and epiphysis. The cells of the epiphysial cartilage next to the diaphysis pass through changes similar to those I have described as occurring at a centre of ossification, so that at this vascular line there is a constant formation of calcified cartilage, and therefore of a very friable structure, and its replacement by osseous tissue.

"The circumference of the epiphysial disk of cartilage is pro-

longed over the outer surface of the diaphysis, passing into and forming the deep layers of the periosteum. In fact, the osteoblasts of the deep layer of the periosteum in the growing bone are derived from the protoplasm contained in the cells of the epiphysial cartilage. It follows that as the various bones of the body arrive at that period of growth when the epiphysial disk has formed, the extremities of their diaphysis are enclosed in a cup-shaped piece of this cartilage; in this way, if pus forms in the soft structures at the extremities of the diaphysis, it is directed outward by the cartilage into the deep layer of the periosteum. Matter collecting at the extremity of the diaphysis is prevented by the cartilage from extending into the epiphysis or into the synovial cavity of the neighboring joint.

"In infant life, before the epiphysial disk of cartilage has formed, the centre of ossification of the epiphysis is, however, contained within the synovial membrane; so that, if this isolated portion of bone becomes inflamed, suppurative synovitis is almost sure to occur; for it is interesting to note that the epiphysial cartilage is prolonged during fœtal life into the tissues which are developing into the future synovial membrane; this membrane may be considered as a modified form of periosteum passing from one bone to the other."

Kölliker and others have shown that the extremity of the diaphysis grows quickest whose epiphysis remains the longest separated, demonstrating Professor Humphrey's law, that the growth of bone is chiefly in the direction of its nutrient artery. The condition of the medulla and the remainder of the bone need not be entered into, as we have simply introduced so much of the anatomy as was essential to a clear understanding of the disease in question, and to show why in infants the symptoms must necessarily be somewhat different from those in adults.

With this knowledge of the subject the pathology is more readily understood. Of course, in an article of this character, it is not proposed to go into the entire subject of osteomyelitis.

Pathology.—The pathology of acute arthritis of infants has not been dwelt upon at any length by the earlier writers, although all of them look upon it as a pyæmia of bone. Howard Marsh[1] says the pathology of the affection is obscure. It begins, usually, in the epi-

[1] Diseases of Joints, American edition, 1886.

physis as a hyperæmia or congestion of the bloodvessels situated within this structure, or in some cases in the dividing line between epiphysis and diaphysis, or rarely in the diaphysis. This congestion is soon succeeded by inflammation and the rapid production of pus. The pus soon enters the joint cavity, though in many cases the opening is no larger than a mere pin-hole. Mr. T. Smith says that in several of his cases that was entirely overlooked until after he had made sections of the bone, and thus discovered the opening. The pus instead of entering the joint, or even after the joint has been invaded by the breaking down of the tissues beneath the epiphyses, may burrow along under the periosteum and open through it at a point remote from the joint—a fact to which Mr. Morrant Baker has called special attention, and also MacNamara. This abscess is "sub-articular" at the beginning. In some instances, before the pus escapes to the surface, it may follow down through the medulla, which, in infants, is not a distinct canal, and thus invade a neighboring joint or produce the same effect by dissecting down under the periosteum along the shaft. Again, it may be absorbed into the general system and an abscess occur by metastasis in some distant joint, in the soft parts, or in some of the viscera.

The character of the pus varies considerably. It may be thick, yellowish, and sticky and in some cases tinged with blood, or dark-brown in color and thin. The time at which it is examined, no doubt, influences its character, for we might reasonably expect to find it different when confined to the bone alone, or when involving the joint and the adjacent soft parts.

M. Kiener[1] has shown that numerous microbes are found in the tissues contained in bones affected with this disease, and mentions the staphylococcus aureus and albus. Rodet[2] is quoted by Ollier at the first congress of French surgeons as having produced all the varieties of juxta-epiphysial osteitis by inoculations with fluid cultures of the staphylococcus aureus. In Case XVIII. reported in this paper, both the staphylococcus aureus and albus were found, and another form unnamed.

Destruction of the epiphysis soon begins, and the necrotic process

[1] Quoted by MacNamara: Diseases of Bone.
[2] Rodet: Rev. de Chir., 1885.

may go on to the entire destruction of the articular end of the bone. The necrosis may result in the formation of a sequestrum, but usually as the disease advances the pus carries away the broken-down bony and cartilaginous tissues, and at an early period we get grating in the joints, due to the destruction of the cartilage on the bone ends, thus allowing the rubbing together of the two rough surfaces. With the destruction of the epiphysis or its separation from the diaphysis the normal movements of the joint affected are altered, and we may get either a pathological dislocation or a flail-like joint; rarely we get ankylosis. The dislocation of the bone from its articulation may also be due to the destruction of the joint capsule by the products of inflammation, or by destruction of the soft parts adjacent to the articulation. After the products of inflammation have reached the surface and been discharged either by spontaneous rupture or by an incision, the tendency is for the disease to subside with considerable rapidity, and usually the discharge soon ceases and a reparative process is begun. In those cases where the abscess is sub-articular and opens into the joint by a small opening, if the products of inflammation are evacuated early, there may be very slight change in the synovial membrane, the cartilages, and ligaments; but if the products of inflammation remain long in the joint the various structures entering into it may undergo serious changes, and even be completely destroyed.

The probable reason that the epiphysis is most frequently the starting-point of the disease is that the age of the patient is a predisposing cause, for when the bone is being produced and growth taking place, the centres of ossification of the epiphyses are the most vascular portions, and any congestion is more liable to occur here than at any other point.

Prof. Alex. S. Bobroff, of Moscow,[1] in reporting ten cases of osteomyelitis in adolescence, says it most frequently attacks the epiphyses of long bones, and thinks it due to the fact that the medullary cavity and spongy tissue of the epiphyses derive their blood from the nutrient arteries, which on their entering into the canal break into an extensive network with relatively retarded circulation. The retardation reaches its maximum about the epiphysial

[1] Rhinirgitchesky Vestnik, April and May, 1889.

cartilage, thus favoring the lodgement of pathogenic microbes, and the staphylococci are carried by the veins, either entering by the skin or respiratory organs. The several forms of staphylococci found in acute arthritis of infants also cause multiple abscesses not connected with the bone, and Bouillaud,[2] writing on the subject, quotes Escherich as saying that in all children at the breast, whether they be well or ill, the staphylococcus albus and aureus are constantly to be found in the liver and in the more superficial layers of the epidermis. These pyogenic germs may enter the sebaceous or sudoriparous glands and set up inflammation, although usually they enter through a breach of the surface, which is so common in the tender integument of an infant. Of course, these same germs it carried further and lodged in the bone would cause a destructive process to be set up there.

As yet no separate and distinct form of coccus has been discovered in acute arthritis of infants different from what we find in osteomyelitis occurring at a later age, and we cannot but conclude that the disease is a pyæmia of bone.

In this connection I may be allowed to quote from Park's article on acute infectious processes of bone.[2] He says: "The view that acute osteomyelitis sustains a close relation to pyæmia is hardly expressing it strongly enough. It not only leads to pyæmia, but it is almost from the beginning a pyæmia. This is to be explained, of course, on the anatomical ground that osteomyelitis is essentially a septic phlebitis of bone-marrow, and when we remember the most important *rôle* played by the veins in the production of the pyæmic condition, we can see how almost immediately an osteomyelitis, regarded in this light, becomes first a local, then a general pyæmic condition. Osteomyelitis . . . is one manifestation of the pathogenic properties of several microörganisms possessing common specific pyogenic activities. It is a phlegmon of bone or a local pyæmia," and his conclusions may well be quoted:

"(1) There is no specific microbe for the production of acute infectious processes in bone.

"(2) Most, if not all, the staphylococci can cause them; exceptionally the streptococci may exert such an influence.

[1] Annales de Gynécologie et d'Obstétrique, 1888, p. 81.

[2] American Journal of the Medical Sciences, July, 1889.

"(4) Of all the forms, the staphylococcus aureus is most pernicious.

"(5) Of the general causes which favor their entrance, the diathetic conditions, such as the tubercular and the dyscrasial, like the syphilitic and post-febrile, play a most conspicuous part. Age—that is, childhood—is always a predisposing cause."

An interesting fact has been brought out by some observers, especially by Lannelongue, that in later life an acute process may be produced from an old "infection" which may have been latent for many years, and where such a process occurs the previous history may be of importance.

We may appropriately here consider the results produced by the disease in those cases which recover. In slight cases where but little injury has been done to the bone or soft parts, the joint may be as good as before. In the upper end of the femur, when the epiphysis has become separated from the remainder of the bone, and in many cases the ligaments affected, the thigh-bone may be displaced on to the dorsum ilii, and the condition resemble "congenital dislocation of the hip." The motions are free, and the limb is shortened from two causes: first, from the loss of the epiphysis; second, from the bone being displaced, as in a dislocation. The patient often walks well, but the shortening of the limb will produce some lateral curvature of the spine, due to the tilting of the pelvis. In some cases where the bone has become displaced, instead of the signs of a pathological dislocation, we may have the limb ankylosed and in a faulty position. This is unusual, however. At the knee, if it is the lower epiphysis of the femur which has been destroyed, the movements of the joint will be free—in fact, freer than normal, there will be shortening of the limb, and the same secondary changes in the spinal column. The loss of the upper epiphysis of the tibia produces the same effect on the joint and a marked loss of length of limb, and in Case X. reported by me, where the fibula was uninjured, whilst the tibia has ceased to grow from its upper end, the fibula has continued to increase in length, and owing to its being attached above to the tibia and below at the ankle-joint, has become markedly bent, the convexity of the curve being on the outer side of the limb. (For further particulars see report of case.)

At the shoulder, elbow, and other joints, similar results may occur.

In some cases the sequestrum may remain behind and cause trouble, necessitating its removal. The necrosis of the bone, when it extends to the shaft, may destroy much bony tissue, and if at the same time the periosteum is affected, the resulting deformity may be extensive. Howard Marsh[1] speaks of a case where the stump-like ends of the femur and tibia could be freely moved on each other, and were found to give way whenever the child, who was then twenty-four months old, bore any weight upon the limb. In another instance, the upper end of the tibia had slipped backward into the popliteal space, and was overhung by the projecting lower end of the femur, and in this position the two bones were cicatrized together. Mr. George Brown reports a very interesting case, showing how extensive the necrosis may be[2]—where in a child eight months old, following acute arthritis of the knee, there was necrosis of the entire shaft of the tibia. Amputation was done and the child made a good recovery.

Etiology.—The causes of acute arthritis in infants are not always easy to ascertain. In a number of cases the most careful investigation fails to discover any. Traumatisms of varying degrees of severity are more frequently assigned as a cause than anything else, and when we consider how slight an injury in an infant may produce a severe contusion, not only of the soft parts but of the deeper structures, we are not surprised at this. Rough and careless handling of a newborn babe may easily produce sufficient injury to the epiphysial end of the bone to cause the disease. Again, we may get a distinct history of injury, such as a fall from the crib or from the mother's arm, or that in turning the child over in bed, or even that at its birth more force was used than the delicate structures could stand, and thus a severe strain or wrench of the soft parts or even of the joints and bones occurred.

Pyæmia, or the absorption of pus from some other portion of the body, in many instances acts as an exciting cause. In some cases the exact point is easily demonstrated. A suppurating umbilicus may be the starting-point and the hip or knee-joint affection be secondary to it. In one of the cases reported in this paper the above state of affairs existed. Dr. Huber, of New York, tells me that he

[1] Howard Marsh: Diseases of the Joints, American edition, 1886.

[2] George Brown: Acute Arthritis of Knee-joint and Necrosis, etc. Trans. Clin. Soc. London, vol. ix. p. 175.

has had in his practice two cases of arthritis of the hip following an ulceration of the umbilicus. The autopsy book of the State Emigrant Hospital, Ward's Island, N. Y., for 1877, also contains the notes of a similar case where both sterno-clavicular joints contained pus, and the bones entering into the articulation were eroded. The pyæmic joint trouble may be caused by an open wound in some portion of the body and infection through the proper channels, the veins probably being the principal carriers of the microbes. Then there are cases where we cannot say positively whence came the infection. Roswell Park[1] says "that the infection may occur through the ears, eyes, nose, mouth, pharynx, respiratory passages, mucosa of the alimentary canal, or skin; or, in other words, through any lesion of external or internal body surfaces. Furthermore, from any subcutaneous phlegmon, however small." So that in a case presenting the characteristic symptoms of the disease, and with the characteristic lesions, we might have to look over all the above before we could positively say how the infection came to be introduced into the system. The wound, excoriation, or superficial or deep lesion may readily be so minute as to escape our observation.

The various exanthemata may act as exciting causes. T. Holmes[2] mentions an interesting case of suppuration in the hip-joint of an infant seven months old, following chicken-pox. Dr. K. McLeod[3] details a case of epiphysitis due to variola, and another interesting case is reported by Ancell[4] in a babe eleven months old, suffering with variola. An eruption appeared, and discoloration commenced on the tenth day; upon the eleventh the infant showed signs of distress, various swellings occurred in the neighborhood of the joints, and fluctuations soon followed with dilatation of superficial veins. After death, diastasis of most of the epiphyses was noted, while various joints were filled with pus.

Typhoid fever in older children is in many instances an exciting cause of periostitis, but I have found no cases recorded where a suppurative arthritis followed. Measles was ascribed as the exciting cause in one of Mr. Wright's cases. Scarlatina also may be com-

[1] American Journal of the Medical Sciences, July, 1889.

[2] T. Holmes: The Surgical Treatment of Diseases of Infancy and Childhood.

[3] Indian Medical Gazette, 1883, p. 232.

[4] Archives of Medicine, 1830, vol. iv. p. 491.

plicated or followed by a joint trouble of a purulent character, and most writers on diseases of children speak of it. Eustace Smith[1] says the trouble may be pyæmic, rheumatic, or the expression of the scarlet fever in the joint.

Dr. A. H. Ashby,[2] of Manchester, has written an interesting article on the surgical complications of scarlatina, and describes four varieties: synovitis; acute or chronic pyæmia; acute or subacute rheumatism; scrofulous disease of joints. He only reports three cases where the fluid in the joint was purulent in character, and does not give the ages of the patients except in one case, a boy of two and one-half years. Acute arthritis of infants has also been known to follow whooping-cough.[3]

Empyema is given as the exciting cause in a case reported by Mr. John Abercrombie,[4] and in a case related to me by Dr. Huber, of New York. The empyema was complicated by a purulent effusion into the metatarso-phalangeal articulation of the big toe of the right foot.

Tubercular disease or scrofula must, of course, when it exists in the parents, have a tendency to weaken the child's constitution, and render it more susceptible to any form of disease. Especially must it place the infant at a disadvantage when attacked by an acute disease which quickly lowers its vitality. Syphilis, as we know, produces disease and changes in the bone, but not of the character we are discussing; yet there is no reason why pyæmia should not attack a patient suffering from inherited syphilis. In most of the cases I have seen reported nothing is said as to the question of tuberculosis being inherited, or as to the question whether the parents were tubercular or not. In the cases I have personally seen this point was carefully examined into, and in only a small proportion of cases was there any tuberculous history. The age of the child is a matter of great importance, and nearly all cases have occurred in children under one year.

Symptoms.—The symptoms of acute arthritis in infants are quite constant, only we have different forms of severity of the disease.

[1] Diseases of Children. Philadelphia, 1886.
[2] British Medical Journal, May 22, 1886.
[3] Diseases of Children. Ashby and Wright, 1st edition.
[4] Transactions Pathological Society, London, 1881, xxii. 192.

In most cases the disease is ushered in by a chill, although in a very young infant this may be absent or difficult to detect. A rise of temperature follows the initial chill, and in the very severe cases this may be well marked and at an early date be extreme. There is usually a difference between the evening and morning temperatures, the latter being the lower. The joint affected very soon becomes flexed, and in all the cases I have seen in the acute stage this was one of the most constant symptoms. Any effort at straightening the limb is resisted by muscular spasm and usually causes considerable pain. The child may be very restless and fretful, and this may be due directly to the pain produced by the disease in the bone and articulation. A purulent effusion soon takes place in one or more joints, there is increased heat, limited motion at the articulation, and as the pus increases the superficial tissues may become red and œdematous, or may be brown and glazed in appearance. The superficial veins become enlarged, the abscess with more or less rapidity invades the surrounding tissues, and in arthritis at the knee may extend to the hip, or a considerable distance down the limb, toward the ankle.

Whilst the local symptoms are increasing the constitutional symptoms become marked, the temperature rises until in the evening it may be 104° or over; the child becomes wasted, pale, sallow, has an anxious expression, may be delirious or have convulsions, or may have several chills followed by fever; and unless the patient's constitution be very strong or the surgeon interferes, the case rapidly goes on to a fatal termination. Very acute cases have been known to run their entire course in thirty-six hours. In these acute and severe cases the exhaustion or pyæmic deposits in some of the viscera are the usual causes of death. In other cases the initial symptoms are the same, but the disease does not run nearly so rapid a course, and the abscess or purulent collection in the joint is formed more slowly. The constitutional symptoms are not so severe, and the effusion in the joint or the abscesses in the surrounding tissues, though they be large, gradually come to the surface and discharge, or are opened by the surgeon, and the little patient makes a rather rapid recovery, considering the nature and severity of the disease.

Another cause of death is given in a very interesting case reported by Wilmott,[1] entitled "Notes of a case of obscure abscess of the hip-

[1] Wilmott: Australian Medical Journal, Melbourne, 1882, N. S. iv. 344, 347.

joint in an infant, with death from pressure on the right common iliac vein." The child was six months of age, and had been ill five weeks when seen by Dr. Wilmott—supposed cause, a fall from perambulator, at which time the leg was twisted more or less severely. The most marked symptom was a slight swelling in the right groin and right labium. There was flattening and increased width of the right gluteal region. The child died on the twelfth day. The post-mortem showed that the abscess had burrowed up the course of the psoas muscle and down it on to the right thigh. The head of the femur and the upper rim of the acetabulum were denuded of bone, the capsule of the joint was ruptured on the inner side, the right common iliac artery and vein were involved in the inner side of the abscess wall, and in the vein was an embolus. Mr. Wilmott believes, had the case not died from embolism, the abscess would have ruptured and pus gotten into the peritoneal cavity, and thus caused death.

Diagnosis.—The diagnosis of acute arthritis of infants, though in most cases not difficult, yet at times is perplexing. It may be confounded with acute rheumatism, sprains and contusions of the joints, syphilitic disease of the bone, abscesses in the neighborhood of an articulation, or what is sometimes called "acute periarthritis," and with malignant growths, and, in some rare instances, with a tubercular osteitis, in which abscesses appear early, and the symptoms at the onset are unusually acute, or in later years the previous disease may be overlooked, and the case mistaken for a congenital dislocation.

From acute rheumatism the diagnosis can be made by examining the character of the joint effusion. In rheumatism it is thin or flaky, but not purulent, and the swelling is confined to the joint and does not invade the surrounding tissues. The rheumatic diathesis must also be inquired into, and the general condition of the patient taken into account. In the purulent effusions the constitutional symptoms are more severe, and the emaciation, loss of flesh, etc., more marked.

In sprains and contusions, although several joints may be involved, there are usually slight if any constitutional symptoms, but little pyrexia, and no loss of flesh or signs of blood-poisoning. It is the tissues about the joint, or, rather, superficial ones, which are involved, and a careful examination will disclose this fact. Then,

the course of the two affections is very different. The following case well illustrates these differences:

Louis Shimmel, aged three and one-half months, seen at out-door department of Hospital for Ruptured and Crippled, July 6th. Fell three days ago from a chair; right ankle and left wrist are hot and swollen; no pus found by examination with hypodermatic needle; movements of joints slightly restricted; temperature normal. Child in good physical condition. Ordered hot fomentations. Aug. 15th: Examination shows no trace of former trouble. Mother says that in three days after the child was brought to the dispensary he was perfectly well again.

Syphilitic disease of the bones in infants is the trouble for which we are most apt to mistake arthritis of infants, and in all cases the history of syphilis must be carefully inquired into.

Taylor,[1] speaking of the variety with which we are interested, says: "The most extensive form of degeneration of these osseous swellings, in which there is a separation of the epiphysis from the diaphysis, appears also to be the rarest in practice." Since then quite a number of cases have been reported, and this form of epiphysial separation is well recognized. It is usually met with in children under one year of age. Node-like swellings occur near the articular end of the bone or bones involved. These swellings increase with more or less rapidity, suppuration in and about the joint follows, the epiphysis is destroyed, and, as a result, deformities ensue.

The history of syphilis, the fact that swelling begins at a slight distance from the articulation and extends to it secondarily, that at first no fluctuation is present, that usually several joints are affected, that epitrochlear and post-cervical glands are enlarged, that some of the specific forms of skin disease are often present, and that progress of the disease is usually not so rapid, and is relieved by the proper anti-syphilitic treatment, are all points of importance in arriving at a diagnosis.

From an "acute periarthritis," or an abscess adjacent to the articulation, the diagnosis is easily made. We have generally a his-

[1] Taylor, R. W.: Syphilitic Lesions of the Osseous System in Infants and Young Children. New York, 1875.

tory of traumatism and a more or less rapid formation of pus in the periarticular tissues, without the joint being involved. If abscesses be large, there may be severe constitutional symptoms, but other joints are not affected, and the symptoms are generally purely local. The following case is a typical one:

H. O., aged two years. Came to the Hospital for Ruptured and Crippled, out-door department, June 13th. Four weeks ago fell out of a cradle, twisting her leg. For the past three weeks a swelling has been gradually forming just above the internal condyle of the left leg. Child strong and healthy; no specific history; abscess about the size of a walnut; joint motions good. Opened by free incision, and large amount of pus discharged; poultices ordered. Aug. 15th: Is perfectly well; joint motions good.

In cases where the formation of the abscess has not been very rapid, and is of great size, tissues glazed in appearance, superficial veins much dilated, cachexia extreme, acute arthritis of infants may easily be mistaken for malignant disease. Such errors have been reported by many competent observers. The use of the hypodermatic needle, the involvement of the neighboring lymphatics, the rate of growth, a careful examination of the tumor and surrounding tissues, and the motion in the adjacent articulation, if carefully looked for, will in all cases render a diagnosis clear, though it may at first seem difficult.

Tubercular osteitis of the hip, or hip-joint disease, is very rare under one year of age. Gibney[1] says that 61 out of 560 cases analyzed began before the second year, and that the disease is known to begin as early as the eighth month, but he is rather sceptical as to these very early cases being "chronic osteitis." In the early cases of hip-joint disease the reflex spasm is an important symptom. The osteitic cry and the less marked constitutional symptoms, also, are aids in diagnosis, and I think it doubtful if, with ordinary care, hip-joint disease can be mistaken for acute arthritis of infants.

Treatment.—Mr. Holmes[2] remarked in 1869 that "acute joint disease leads directly, and in childhood almost inevitably, to abscess,

[1] Gibney: Diseases of the Hip.

[2] The Surgical Treatment of the Diseases of Infancy and Childhood, by T. A. Holmes London, 1869.

and it is in my opinion very important that this should be opened at the earliest possible moment." To-day no better advice could be given. Once the diagnosis is made, the purulent collection, whether in the joint or the surrounding tissues, should be evacuated. Delays are dangerous. Free incisions, thorough drainage, and antiseptic precautions alone offer us any chance of successfully combating the disease. The incisions should be sufficiently large to permit thorough drainage. If the abscess has invaded the soft parts about the articulation, the incision should extend down to the bone, and by that, I mean through the periosteum; for underneath it the pus may still be confined. After the joint has been opened and drainage secured, it should be thoroughly washed out with some antiseptic solution, and, if necessary, drainage-tubes or tents of iodoformed gauze or horsehair should be used to prevent the pus remaining in the joint, should more be formed. If the necrosis persist, it may be necessary, either with a gouge or Volkmann spoon, to scrape out thoroughly the sinus leading to the dead bone, and then remove such diseased bone as may be present. If the sequestrum be so situated as not to be readily removed, a more extensive operation will be necessary.

If any fear of ankylosis occur, or the surrounding parts in cicatrizing tend to produce deformity, the use of a proper splint will be necessary to keep the limb in the best possible position. If the loss of bone be very great and the joint rendered useless thereby, the question of excision or amputation will be presented to the surgeon, or it may be necessary to decide upon some form of mechanical appliance suited to the case.

If the deformity produced be confined to the soft parts, section of tendons or of cicatrices may also be necessary. In addition to operative interference, the constitutional treatment should not be neglected. The patient's strength should be supported by stimulants, such as brandy or whiskey, carbonate of ammonium, morphine, and other suitable remedies, and during convalescence tonics should be prescribed. But the most important point is the early evacuation of the pus, whether in the joint, bone, or soft parts.

With the exception of the cases kindly furnished me by Drs. Brown, Huber, Marple, and Walser, all of the cases reported in this paper were seen at the Out-door department of the Hospital for Ruptured and Crippled, New York, during the past year.

In all the following cases I have personally seen, a careful inquiry into the family history, and a careful examination of the patients, failed to reveal any evidences of syphilis. The measurements are all in inches. The letters R. A. mean the distance from right anterior superior spine of ilium to lower end of internal malleolus of right leg, L. A. the same on left leg; R. U. the distance from umbilicus to right internal malleolus, L. A. the same on left side; R. T. the circumference of right thigh; L. T. the circumference of left thigh; R. K. the circumference of right knee; L. K. the circumference of left knee; R. C. the circumference of right calf; L. C. the circumference of left calf; A. G. E. angle of greatest extension; A. G. F. angle of greatest flexion.

Case I.—Charles B., ten months. Right hip. April 17th. Family history negative.

Personal History.—Two months ago mother noticed a "lump" in lower part of the back, which gradually extended to hip and then to the groin. Has had no treatment. Mother has had nine children—four living, five dead. Causes, cholera infantum and teething. Hygienic surroundings where family live are good.

Examination.—Child very much emaciated; has large abscess over outer side right hip, communicating with an abscess about the size of a small hen's egg in groin, which presses the genitals over toward left side; veins over abscess are enlarged. At lower end near scrotum abscess wall is very thin, and pus can be seen through the glazed skin.

Movements of hip, right side, are unusually free. Child very quiet during examination, and though right thigh is held flexed at about 120° movements do not seem to cause pain. No joint grating. Owing to the fact that child had to be taken home, a distance of some five miles, necessitating several transfers on horse cars and trip across a ferry, and that skin was so thin, it was thought best to allow abscess to open itself. Poultices were therefore ordered.

After the application of the second poultice the abscess opened and discharged freely, and the child seemed weaker. Ordered a very small amount of brandy in addition to the mother's milk, as the child was still nursing.

April 20. Child very weak; very little difference in size between the two sides, right hip-joint very movable, no grating in joint. Discharge from abscess consists of a thin, dark-red fluid, and some thick pus. Both legs lie parallel on table. Opening through which dis-

charge occurs is in right groin, oval in shape and about the size of a small pea.

Post-mortem.—(April 26th, twenty-six hours after death.) Child very much emaciated. Rigor mortis not well marked. Permission could only be obtained to examine hip under condition that nothing be removed.

Movements of right hip were freer than those of left. Having adducted the limb and rotated in, pushing it upward, it was found that it could be dislocated and the same easily reduced. Parts about hip were somewhat thickened; opening of abscess was about one-fourth by one-eighth of an inch, oval in shape, situated on inner side of right thigh on a level with Poupart's ligament and about its centre. Passing probe in, it was found to pass upward and backward over the ligament and into the pelvis; withdrawing it, another sinus was found leading outward and downward toward the hip joint. No bare bone could be felt. By bending probe, it could be passed around the hip into gluteal muscles. An incision was made on the outer side of thigh about four inches long, and careful dissection made down to the bone. After cutting through skin, superficial fascia, and the fat, the muscular tissues were found filled with dark-greenish thick pus. The capsular ligament was softened, yellowish-green in color, with one or two dark spots on front aspect of joint, evidently hemorrhages. Its attachment to rim of acetabulum was incomplete posteriorly, and portion where head of bone had come out was easily found. It was firmly attached to the trochanter major and to the front of the bone and inner side.

Cutting away the capsular ligament in front, then on inner side and outer side, bone slipped out of acetabulum. The joint was full of very dark-greenish pus. Ligamentum teres was completely destroyed, no trace of its attachment to femur could be discovered, and its acetabular attachment was only found after thoroughly wiping off the parts, when a small band was seen, much softened, yellowish in color, about one-eighth of an inch in length. The acetabulum was dull grayish in color, but smooth. Cartilage not destroyed.

On femur the cartilage of head was entirely destroyed except a small spot on upper surface, not over one-fourth inch in circumference. The rest of the head was dark brownish-red in color, rough, and especially so at lower portion. The bone below the trochanter minor was normal. Portion of head which was denuded of cartilage was softer than was the shaft of the bone. Abscess posteriorly occupied considerable portion of glutei muscles, and pus had escaped from joint posteriorly and worked round the bone and over thigh to a point where it opened

Case II.—Mary M., two and one-quarter years. Right hip. May 16th. Family history negative.

Personal History.—When ten months old a small lump was noticed on outer side of right thigh, which rapidly increased in size until right thigh was twice as large as left. It was then opened (two months from beginning of trouble) and much matter discharged. It continued to discharge for a few days, then closed and had so remained. Has cicatrix over outer side of hip-joint. Child began to walk when eighteen months old, and has always walked lame.

R. A. 12½. R. U. 16. R. T. 10¼. R. K. 8. R. C. 6½.
L. A. 13½. L. U. 16½. L. T. 10¾. L. K. 8. L. C. 6½.

Right thigh can be pulled down so as to measure nearly thirteen. The trochanter is one and one-half inches above Nélaton's line. No pain, motions good, child walks with a hip limp rather than the gait usually seen in congenital dislocation.

June 27. Condition unchanged as limbs lie parallel and there is no apparent trouble in joint. Nothing is done but to keep up general nutrition.

Case III.—Amelia B., two years and ten months. Left hip. May 20th. Family history: father is phthisical.

Personal History.—When five months old it was noticed that child's toes were bent on left foot, and a few days afterward a swelling appeared over left hip. This increased in size gradually until it was as large as an orange, and child pulled her leg up and has retained it in same position ever since. The swelling then began to extend downward toward knee, and knee became swollen. Swelling finally disappeared. Child is in poor condition. Thigh flexed on pelvis at about 120°, and leg on thigh. Neither can be straightened. Trochanter one inch above Nélaton's line.

May 30. Under ether, leg and thigh were forcibly straightened, and plaster-of-Paris spica applied.

31*st.* New plaster-of-Paris applied, as one put on yesterday had cracked. Thigh extended to about 150°.

June 12. Hip-splint applied.

26*th.* New hip splint applied; child beginning to walk, and thigh can be extended to about 165°.

July 10. Is wearing hip-splint, and walks about considerably. Ordered syr. ferri. iod., as she is pale.

August 1. Child looking well; appetite improved; wearing splint with comfort. Legs parallel.

Sept. 18. Some movement in hip and knee.

CASE IV.—Grace C., fourteen months. Right hip. June 18th.

Family History.—Father's brother died of phthisis. Mother had a cough. None of family ever died of phthisis.

Personal History.—Grace is the second child; labor normal. Is supposed to have fallen one month ago; no certainty on this point. Marked infiltration about right hip, skin bluish, and veins enlarged. All movements resisted.

A. G. F. 120. R. A. $11\frac{3}{4}$. R. U. 14. R. T. 9. R. K. 7. R. C. 5.
A. G. E. 160. L. A. $12\frac{1}{4}$. L. U. $14\frac{1}{4}$. L. T. 7. L. K. 7. L. C. 5.

Hypodermatic needle passed in until it touched bone, and some pus withdrawn. With aspirator one ounce of pus withdrawn: as no more could be evacuated, with antiseptic precautions an opening was made on outer side of thigh, and three ounces of pus discharged. Abscess extended up and down shaft of femur. At point of opening bone was covered by periosteum. Strips of iodoform gauze left in for drainage, and bichloride gauze and bandages applied over this.

June 21. Wound dressed to-day and about one-half ounce of pus in dressings. Parts thoroughly washed out. Probe does not touch bone. Dressed as before. Legs parallel; flexion resisted at about 110°. General condition of child much improved.

July 9. Wound entirely healed; joint motions good.

CASE V.—Stanley Le M., aged fifty-eight days. Right knee. May 20th.

Family History.—Mother's brother died of phthisis. Father's brother died of phthisis. Father has a cough.

Personal History.—When sixteen days old, child's left knee began to swell, swelling then extending down the leg and up the thigh. Child was feverish and fretful. Three weeks ago the abscess broke on the inner side of the knee-joint, and just below it; discharged freely, and is still doing so. Second day after discharge appeared, a small piece of bone came away.

R. K. $6\frac{1}{2}$, 6, $5\frac{1}{4}$. } Leg is held flexed, and can only be extended to
L. K. 7, $6\frac{3}{4}$, $6\frac{1}{4}$. } about 150°.

Just before the abscess on the knee opened an abscess appeared over sternum, which broke in a few days, and cicatrix shows clearly now over sterno-clavicular articulation, right side. Poultices applied to knee.

May 29. Small abscess on anterior surface of leg below knee-joint opened. Probe passed through sinus; goes downward and backward to bare bone. Poultices reapplied.

June 2. One small sinus discharging. Dressed with iodoform gauze.

14*th*. Small piece of bone removed last night from lower sinus. Child doing well.

July 9. Very slight discharge; joint freely movable. Child's general health improved.

17*th*. Some restrictions to joint movement. Straight plaster-of-Paris splint applied.

Case VI.—John A., three months. Left hip. June 19th.

Personal History.—When five weeks old a lump appeared on outer side of left thigh, over trochanter, which was opened and pus evacuated. Patient also comes to hospital for a double hydrocele. Motions of left hip are all restricted, but possibly from soreness left after the incision.

June 26. Child doing fairly well. Has abscess over posterior surface of left hip-joint. As mother objected to its being opened, poultices applied.

29*th*. Abscess opened to day: needle passed into hip-joint; one ounce of pus evacuated. Prepuce dilated, as phimosis existed.

July 3. Opening healed; motion of joint good: much improved.

Case VII.—Frank R., eight months. Right hip. June 11th.

Family History.—Mother's father and sister died of phthisis. Father's family healthy.

Personal History.—Child weak and in poor condition. About four weeks ago an abscess formed in right groin, and opened in a few days. This soon closed, and child kept thigh flexed to about 120°. At present all motions of joint are restricted; there is infiltration over upper part of thigh, and inguinal glands are enlarged. Thigh can be forcibly extended to about 150°; leg slightly flexed on thigh.

R. T. 7. R. K. 7. R. C. $5\frac{1}{2}$. } Right trochanter is about one-half
L. T. 6. L. K. 6. L. C. $5\frac{1}{4}$. } inch above Nélaton's line.

On inner side of thigh is a cicatrix where abscess first opened. One week ago an abscess formed at umbilicus, about the size of a cherry, and has been discharging ever since quite freely, and seems to connect with the old abscess of groin. Child cries at night; nurses well, but sleeps poorly. Ordered hot fomentations, and to return in two days. Never returned. Efforts were made to trace this case, but we were never able to find it. I think the child probably died.

Case VIII.—Euphemia C. Left hip. June 10th.

Family History.—Maternal good. Paternal good. The tenth child; seven living; two died of diphtheria; other, cause unknown.

Personal History.—When one month old had an abscess over left hip; thigh swollen to twice its natural size. Abscess opened by a doctor in East Fifty-third Street. It continued to discharge for four weeks, then healed. Cicatrix about one-half inch long on outer side of thigh. Trochanter three-fourths inch above Nélaton's line.

R. A. 12½. R. U. 14. R. T. 11. R. K. 8.

L. A. 12. L. U. 13½. L. T. 10. L. K. 8.

The left leg can be pulled down one-half inch.

Case IX.—Morris F., ten months. Right knee. July 6th.

Family History.—Paternal good; maternal good.

Personal History.—Mother first noticed signs of pain in knee one week ago. Knee became slightly flexed and swollen; cold was applied, but swelling still increased. Now measures one inch more than opposite knee. Fluctuation positively made out. Hypodermatic needle inserted just under patella, and also above and to inner side of joint, and to the bone, but no pus found. Ordered poultices, and to report in forty-eight hours.

Case then passed into hands of Dr. Silver, of New York, who informs me that he opened the joint, found thin pus and flakes of lymph, washed it out thoroughly, inserted drainage-tubes, and encased the limb in plaster-of-Paris, and that the child made an excellent recovery and has a good movable joint.

Case X.—Walter McC., six years. Seen at Nursery and Child's Hospital, Staten Island, through the kindness of Dr. W. C. Walser.

Personal History.—At three months of age the child had an abscess of right knee, which was lanced at Nursery and Child's Hospital, N. Y. The discharge kept up for a long time, and mother was advised to have the leg amputated, but would not consent. When five months of age was taken to Roosevelt Hospital, and treated, the discharge gradually becoming less, till at eighteen months of age the openings were healed. Had been treated by straight splint, plaster-of-Paris, and also by a brace.

Sept. 8. Boy examined to-day. Is in fine physical condition. Right knee has some lateral motion, but very slight; other movements unusually free. Some grating when joint is moved.

R. A. 19. R. U. 22½. R. T. 11¼. R. K. 9. R. C. 8½.

L. A. 20. L. U. 23. L. T. 11½. L. K. 8¾. L. C. 8.

From internal condyle of right leg to internal malleolus, 7¼.

From external condyle of right leg to external malleolus, 8½.

There is a marked bowing of the fibula outward, due to the fact that it has continued to grow, and tibia has not, at its upper end, as

its epiphysis has been destroyed, and as fibula is attached above and below, it has been forced to bend outward. Boy walks slightly lame, with a high shoe on shortened limb.

Case XI.—Bertha L., aged ten years. Right hip. August 13th.

Family History.—Paternal good; maternal good. Five of family living and in good health. Hygienic surroundings, tenement house.

Personal History.—Health during infancy, good. Dates of vaccinia, 1880, rubeola, 1884, diphtheria, 1885. Present disease: date of inception when eight days old.

The right thigh became swollen and red without any known cause. Swelling was about the size of an orange and extended up on to nates. At the end of two weeks it was lanced, and a cupful of fluid evacuated. For three months afterward thigh was held flexed on abdomen, and finally leg was straightened by weight and has remained so.

R. A. 21.	R. U. 24.	R. T. 11.	R. K. 8½.	R. C. 8.
L. A. 23.	L. U. 25½.	L. T. 13½.	L. K. 8.	L. C. 9.

Head of bone two and one-half inches above Nélaton's line on right side. Flexion good, abduction about half normal, adduction good.

Case XII.—Female, one month, nine days.

Personal History.—Abscesses in both sterno-clavicular articulations, bones eroded, umbilical vein before entering liver impervious, and after reaching it dilated and distended with pus.

Before death the cause of purulent effusion into the joints was considered to proceed from trouble in umbilical vein. The *autopsy* was made by Dr. Thacher, and permission to quote the case kindly given by Dr. Marple, Physician-in-Chief to State Emigrant Hospital, Ward's Island.

Cases XIII., XIV.—Two cases of arthritis of hip due to suppuration at umbilicus. Related to me by Dr. Huber, of New York. Both of these cases terminated fatally.

Case XV.—Case of metatarso-phalangeal articulation, big toe, complicating empyema. Related to me by Dr. Huber.

The two following cases were kindly furnished me by Dr. Dillon Brown, of New York:

Case XVI.—Male, nine months. Left hip. Seen May 16, 1866. Family history negative. No cause known for the disease. Supposed to have come from a cold.

Personal History.—Mother's attention was first attracted to the child's trouble by his complaining of pain in the left hip, which was not benefited by change of position, and gradually grew worse. Parts became tender, a swelling appeared which was very tense, though

fluctuation was easily detected. The superficial veins over it were enlarged, and the outline of the tumor lobulated like a sarcoma, the most prominent portion being over the anterior surface of the thigh. Motions of the joint were painful and restricted. Circumference of left thigh three and one-half inches, from anterior superior spine eight inches. Circumference of the right thigh three and one-half inches, from anterior superior spine seven inches.

June 3. Aspirated, and thin watery pus evacuated.

5*th.* Abscess opened and contents completely evacuated. Motions at joint improved. Child in very poor condition; emaciation extreme; was having night-sweats and diarrhœa, but eventually made a good recovery.

Case XVII.—*Autopsy* on case of acute arthritis of infants, New York Foundling Asylum. Male, eighteen months. Child much emaciated, though had succumbed rapidly to the disease. Motions in left hip-joint good, upper epiphysis of femur was detached from the shaft of the bone, and tissues in and around the joint were infiltrated with pus.

Case XVIII.—Robert C., four months. October 4th. Hygienic surroundings, tenement house. Family history good.

Personal History.—Is a seven-months' child, one of twins. Was perfectly well until one week ago, when mother noticed child was cross. No cause known for it. Day before yesterday ring-finger of left hand began to swell, and next day the right wrist; child was feverish; appetite good; cries continually, and is losing flesh.

Examination.—Ring-finger of left hand is swollen, red; fluctuation detected; is held flexed; swelling is greatest at junction of first and second phalanges, no swelling of hand. Right wrist swollen, on ulnar side swelling is greatest, extra heat, some tenderness apparently. Child looks poorly. Temperature 101°, pulse 120.

Treatment.—Finger opened by incision on dorsum, which was made to extend into the joint, and about fifteen to twenty drops of yellowish pus evacuated. No bare bone felt. Wrist-joint opened on ulnar side, bare bone felt at lower end of radius, and no pus evacuated until point of bistoury was pushed into the lower end of radius. Antiseptic precautions were used; joints thoroughly washed out with bichloride solution, and dressings applied.

October 7. Both wounds looking well. Discharge very slight. Temperature 99¼°.

15*th.* Wrist healed, finger swollen as drainage is imperfect. Several horsehairs, which had been antiseptically prepared, were passed through the joint.

27*th.* Horsehair removed; no discharge on dressings; finger very little larger than normal.

In this case a specimen of the pus was sent to the laboratory of the New York Polyclinic for examination, and Dr. Tuttle, who examined it, reported as follows: Specimen examined October 11th, stained by simple method and by Gram's method, showed scattered about through the field, and occurring in large groups, staphylococci identical in every respect with the staphylococcus pyogenes aureus and albus, and besides these a much larger coccus occurring singly or in short chains or groups, variety not known.

Case XIX.—Sarah N., two months. September 30th. Hygienic surroundings good. Family history negative.

Personal History.—Present disease began six weeks ago, cause unknown. Right knee and both wrists were swollen, knee flexed, wrists held in normal position. Child was taken to a dispensary in town, and on outer side of knee-joint an incision was made and pus evacuated; cicatrix shows plainly; wrists are both swollen and contain pus, as shown by fluctuation, extra heat, and redness. As we would not take the child into hospital mother refused to have anything done. Child in fair condition. Temperature not taken.

The table on page 285 gives the cases that I have been able to find.

Of these 71 cases . . . . . 32 died, or 45 per cent.

In 52 cases one joint only affected:

Of these 52 cases . . . . . 18 died, or 34 per cent.

In 19 cases more than one joint affected:

Of these 19 cases . . . . . 14 died, or 73 per cent.

Sex specified in 49 cases; 31 males, 18 females.

The joints most frequently affected were:

Hip	37 times.
Knee	26 "
Shoulder	12 "
Wrist	5 "
Elbow	4 "
Ankle	4 "
Finger-joint	2 "
Toe-joint	1 time.
Sterno-clavicular joint	1 "

Note.—To the above should be added two cases reported by Ashby and Wright,[1] in children nine months old, one at hip and one at knee, both of which recovered, and which, if taken into account, slightly alter the results.

[1] Diseases of Children. London, 1889.

Joints affected.	Age.	Sex.	Result.	Reported by	Reference.
1. Left knee	4 w'ks	M.	Died,	T. A. Smith,	St. Barth. Hosp. Rep. vol. x.
2. Right knee, left knee, left elbow, left ankle	"	M.	"	" "	" " " "
3. Both hips, right shoulder	9 mos.	M.	"	" "	" " " "
4. Right hip, right wrist	6 w'ks	F.	"	" "	" " " "
5. Left hip	8 mos.	M.	"	" "	" " " "
6. Left hip, right knee	3 w'ks	F.	"	" "	" " " "
7. Right shoulder	10 "	M.	"	" "	" " " "
8. Right hip	7 "	M	"	" "	" " " "
9. Right hip, right wrist	4 "	F.	"	" "	" " " "
10. Shoulder	6 mos.	M.	"	" "	" " " "
11. Left hip, right shoulder	4 w'ks	...	"	" "	" " " "
12. Left knee, finger-joint	5 "	M.	"	" "	" " " "
13. Both hips, elbow, ankle	3 "	F.	"	" "	" " " "
14. Left hip	5 mos.	M.	Recov.	" "	" " " "
15. Left hip	3 "	M	"	" "	" " " "
16. Left hip	7 "	F.	"	" "	" " " "
17. Knee	5 "	M.	"	" "	" " " "
18. Knee	10 w'ks	M.	"	" "	" " " "
19 Knee	6 mos.	M.	"	" "	" " " "
20. Knee	1 year	M.	"	" "	" " " "
21. Right shoulder, left elbow, and left ankle	9 w'ks	M.	"	" "	" " " "
22. Hip	18 mos.	...	Died,	Judson,	N. Y. Med. Journ., Dec. 1878.
23. Hip	8½ "	F.	Recov.	Gibney,	Diseases of the Hip.
24. Left hip	10 "	M.	"	"	" " "
25. Hip	3 w'ks	...	Died,	MacNamara,	Dis. of Bones and Joints, 1881
26. Left knee	5 mos.	M.	"	Barwell,	Dis. of Joints, 1881.
27. Shoulder	3 w'ks	...	"	MacNamara,	Lancet, 1879, ii. 231, 267.
28. Left knee	8 mos.	...	Recov.	G. Brown,	Clin. Soc. Trans, ix. 175.
29. Knee	.....	...	"	Dr. Berlin,	South. Pract., Nashville, 1885, vii. 72, 75.
30. Knee	2 mos.	...	Recov.	J Abercrombie,	Trans. Path. Soc., London, 1881, xxxii. 192.
31. Right shoulder, right hip	13 "	M.	Died,	Charles Atkin,	Med. Press and Cir., London, 1885. [No. 43
32. Right knee and left elbow	7 w'ks	F.	"	Krause,	Berl. klin. Wochen, 1884,
33. Right knee	6 mos.	...	Recov.	W. Morrant Baker,	St. Barth. Hosp. Rep., 1880.
34. Left hip	12 "	F.	Died,	Krause,	Berl. klin Woch, 1883.
35. Metatarsus, 1st and 2d	14 days	F.	"	Huber,	Arch. f. Path. Anat. Ber. 1882
36. Knee	9 w'ks	...	Recov.	W. Morrant Baker,	St. Barth Hosp. Rep., 1880.
37. Knee	4 mos.	...	Died,	Owen,	Lancet, 1871, i. 246.
38. Shoulder	8 "	...	Recov.	Owen,	Surgical Dis. of Children.
39. Right hip	6 "	M.	Died,	Wilmott,	Austral. Med. Journ., 1882.
40. Hip	7 "	...	Recov.	T. A. Holmes,	Surg. Treat. Dis. of Children.
41. Left knee	11 w'ks	F.	Died,	G. A. Wright,	Lancet, 1871, ii. 127.
42 Right hip	13 mos.	F.	Recov.	" "	" " "
43. Right shoulder	19 days	F.	Died,	" "	" " "
44. Hip	.....	...	Recov.	Howard Marsh,	Dis. of the Joints, Am. ed.
45. Hip	.....	...	"	" "	" " " "
46. Hip	.....	...	"	" "	" " " "
47. Knee	.....	...	"	" "	" " " "
48. Knee	.....	...	"	" "	" " " "
49. Knee	.....	...	"	" "	" " " "
50. Both hips, right knee, both shoulders	3 days	M.	Died,	Terrisse,	Thèse de Paris.
51. Right hip, both knees, left ankle, and wrist	4 "	M.	"	"	" " "
52. Left knee	6 "	M.	"	"	" " "
53 Right hip	10 "	F.	Recov.	Gibney,	Med. Rec., March 5, 1889.
54. Right hip	10 "	M.	"	Townsend,	
55. Left hip	5 "	F.	"	"	
56. Right hip	14 "	F.	"	"	
57. Left knee and right sterno-clavicle	58 days	M.	"	"	
58. Left hip	5 w'ks	M.	"	"	
59 Right hip	7 mos.	M.	"	"	
60. Left hip	1 mo.	F.	"	"	
61. Right knee	10 mos.	M.	"	"	
62. Right knee	3 "	M.	"	"	
63. Right hip	8 days	F.	"	"	
64. Sterno-clavicle (both)	39 "	F.	Died,	"	
65. Hip	.....	...	"	"	
66. Hip	.....	...	"	"	
67. Metat. phalang. big toe	.....	...	Recov.	"	
68. Left hip	9 mos.	M.	"	"	
69. Left hip	18 "	...	Died,	"	
70. Right wrist, finger-joint	3 "	M.	Recov	"	
71. Right knee, both wrists	2 "	M.	"	"	

Conclusions.—From a study of the disease I think the following conclusions may be drawn:

1. Acute arthritis of infants occurs most frequently during the first year of life.

2. It is pyæmic in character, an osteomyelitis of infant life, and is caused by one of the forms of staphylococci, most frequently the staphylococcus albus or aureus; may follow traumatisms or the exanthemata.

3. The most frequent site of infection is the epiphysis near the joint, which in early life is frequently intracapsular.

4. The disease progresses rapidly, and nearly fifty per cent. of the cases have terminated fatally, the most frequent cause of death being exhaustion.

5. A more or less complete destruction of the "joint end" of the bone, pathological dislocations, flail-like joints and loss of length of limb, rarely ankylosis, are the most common results of the disease.

6. Disease is most frequently met with in hip, knee, and shoulder.

7. As soon as the disease is recognized the pus should be evacuated promptly, the joint properly drained, and parts dressed antiseptically.

8. The treatment of resulting deformities should be conducted on general orthopedic principles.

A CONTRIBUTION TO THE STUDY OF FLAT-FOOT.

By V. P. GIBNEY, M.D.,
NEW YORK.

I am indebted to Dr. Robert Abbe, of this city, for a suggestion which he carried out during the last winter and spring. He remarked to me one day, while passng through the hospital, that he had recently relieved two cases of painful flat-foot by operating for ingrowing nail on the same foot. Since presenting my paper at the Boston meeting Dr. Abbe has kindly furnished me the notes of the cases which led to his enthusiastic remark. With his permission, therefore, I take pleasure in adding them to my own.

Shortly after his conversation with me it happened that, on the 12th of May, a patient, a gentleman from San Francisco, about twenty-seven years of age, who had come to me in the early part of the present year for painful flat-foot (referred by my friend, Dr. Harry Sherman, of San Francisco), came into my office complaining of a failure during the spring to get the relief which we had both confidently expected. This gentleman had been suffering for two and a-half years with an annoying pain in the sole of his foot, which pain, he thinks, followed an attack of subacute rheumatism. I found on examination, January 30th, a point of tenderness over the scaphoid, near its junction with the first metatarsal. I had no difficulty in restoring the arch of the foot by manual force, and he felt some relief. He had worn, however, the various kinds of steel springs, and had had massage employed and various operations suggested, etc. I had his shoe built up after the plan of Mr. Thomas, of Liverpool, and prescribed faradism for the posterior tibial group of muscles. This was well carried out, and he for a time got relief. He did not get entire relief, however, and I had him see Dr. Jacobi, on the 2d of April, with regard to the existence of any rheumatic element. Dr. Jacobi wrote me as follows:

"He has a periostitis of the lower face of his first (and second) meta-

tarsal bones." He saw one or two distinguished surgeons in the city, one of whom suggested an exploratory operation on the bone. It so happened then that, a few days after Dr. Abbe's suggestion, this gentleman came into my office. He came in one evening in great distress, complaining that his foot was no better, and that an ingrowing nail on the same foot, great toe, was giving him much annoyance. I found the toe very much inflamed, and also learned that he had had this ingrowing nail for two or three years.

The following are my notes:

May 14. Under ether the offending portion of the nail was removed, the exuberant granulations were removed also, and the toe dressed antiseptically.

23*d*. Wound was about healed, pain is very much relieved, and he starts to-day for California.

September 12. A friend reports that she has recently heard from him, and he says he has not had an ache or a pain since he left for San Francisco.

Dr. Abbe's cases are as follows:

Case I.—One year ago a lady was referred to me for relief of intractable plantar pain of one foot that had resisted treatment at the hands of her physician. I thought the arch of her foot slightly depressed, and numerous plantar pressure diagrams showed the paper tracing broader than that of the opposite foot. My sole belief was for some weeks that she had beginning flat-foot and corresponding pain. I had her shoe built up after the suggestion of Bernard Roth, and carried out systematic massage after his principles—but without benefit.

One day I noticed her great toe-nail was buried deeply into the flesh, without, however, either inflammation or granulation. I advised her to let me do Cotting's operation, which I universally resort to under cocaine for ingrowing nail. She consented, and had the pleasure of being relieved at once of her neuralgic foot, and of being able to walk half a mile at a time without pain; whereas, before operation, to walk half a square would give her the greatest plantar pain.

After three or four months some of her old pain came on again, and I found the cicatrix under the nail tender to pressure. This has since been entirely relieved, and she has proved her recovery by long and painless tramps during the past summer.

Case II. During the last winter a heavily built German woman was sent to me with pronounced flat-foot of several years' development, but with plantar pain of a few months' duration. I at once noticed a well-developed case of ingrowing toe-nail, and she consented to Cotting's operation. She lived away from the city, and I was only able to keep her under my eye for a week. During that time, however, I let her walk about her house, and she was entirely free from the plantar pain. I am unable to report of her case since then.

TRAUMATISM OF THE HIP, SIMULATING THYROID DISLOCATION.

By T. HALSTED MYERS, M.D.,
NEW YORK.

E. A., aged nine years, was first seen July 29, 1889, and gave the following history:

She was playing, and fell on the sidewalk three and a half weeks ago, striking on her left hip. She immediately walked to the house, with marked limp, but suffered almost no pain. Her father says that the leg was then in exactly the same position as at present. Since the evening of the fall the patient says she has had no pain. Her sleep has not been disturbed, and she has been playing about every day, but the deformity persisted. Dr. W. S. Carr, who attended her a week after the accident, writes me: "There never was any swelling, and but very little tenderness over the greater trochanter. When she stepped the foot and knee were slightly everted."

Examination.—In standing patient holds left thigh advanced, with slight knee flexion, and foot in equinus, with 45° of outward rotation of thigh. In supine position there is flexion at the hip of 160°, and abduction of 30°. When legs are approximated the left is apparently $1\frac{1}{4}''$ longer than the right. There is, however, no *real* difference. There is a marked depression over trochanter major, and the trochanter is $\frac{3}{8}''$ above Nélaton's line; on flexing both thighs to 90°, left leg is 1″ higher than the right; but *all these facts seem due to the abduction.* Adduction and extension are impossible. Rotation, abduction and flexion are allowed to a considerable extent, and when limited there is not the quick, hesitating spasm characteristic of the second stage of morb. cox., but rather the firm resistance of a dislocation, or an ankylosis.

The whole history, except the absence of pain, suggested thyroid dislocation, and in respect to pain I remembered that Dr. L. A. Stim-

son had lately mentioned cases of this dislocation where pain was not complained of, the patients seeking advice because they "could not bring the legs together."

Repeated examinations were made for the head of the femur, but no displacement could be found. There was slight thickening in the inguinal region, but nothing else, and as the patient was not fat, and was examined once under ether, I feel sure that there was no dislocation of the femur. Under ether the flexion and abduction disappeared, but still adduction and extension were restricted. There was no crepitus elicited, nor any separation of the trochanter major. The spasm returned after the ether passed off, but was less marked. The parts about the joint presented the same appearance as before. The day after the examination there was a little pain in the joint, but by the following day it had disappeared, and I found the flexion, abduction, and rotation had disappeared also. All the joint motions were very free, except extension. There was still some fulness in the inguinal region, and the gluteal crease was shallow.

During the next three weeks there was once or twice a little pain and stiffness in the joint. The long traction splint was now applied, and four weeks later I made the following note: "No shortening, no atrophy; motion free and smooth in all directions to full extent. Complains of slight pain in hip at limits of flexion on *both* sides. Spine and pelvis normal. Pressure over trochanter causes a little superficial pain there. Patient allowed up without support.

The child had been *perfectly* well before the accident, and her family history is good.

The nature of the accident and the onset of the symptoms negative a diagnosis of morb. cox. The examination excluded thyroid dislocation and periarticular affections. Acute synovitis should have given pain.

In view of these facts, and because we know that involuntary muscular spasm is an indication of bone disease, and especially of that part of the bone lying immediately below the articular cartilages; and for the further reason that pathological reports show that a separation to a greater or less degree of the cotyloid ligament and the bone sometimes occurs in cases of dislocation proper, even where the pressure is relieved by the rupture of the capsule, I would suggest that the lesion in my case was probably a partial separation of this kind.

The literature of traumatism of the hip without fracture or dislocation is so meagre that I present this case rather fully, feeling especially interested in the questions of pathology and prognosis.

The patient has now been without protection for but four days, and I do not consider the case cured, though all motions are free and smooth to the extreme normal limit. There is, however, when both knees are brought in contact with the chest-wall, a little more tenderness in the left than in the right groin, and there is still, on very close observation, a slight tendency to favor the left leg in walking or running.

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